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MET O 3 TECHNICAL NOTE NO 16

THE CALCULATION OF THE 1951-80 climatological AVERAGES

Advisory Services (Met O 3)
Meteorological Office
London Road
Bracknell
Berkshire

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PART A THE ORIGINAL DATA AND ITS QUALITY CONTROL

1. Introduction

Monthly summaries (eg means and extremes) of climatological data are held on the B form data set which is documented in Appendix 1. The variables dealt with are air and soil temperature, rain and sun, and the number of days on which certain phenomena were observed. It does not contain information on pressure, humidity, visibility, wind or snow depth. This note therefore describes procedures dealing mainly with temperature and sunshine.

Where possible, the data in the B form data set was derived from daily data held on the MAD data sets, which for most stations started in 1959 or later. For around 214 stations with more or less complete data in the period 1959-80, data for the period 1951-58 was extracted from the manuscript B forms and incorporated into the data set. Values of 10cm and 20cm earth temperatures are only included in the B form data set when the figures were obtained from manuscript sources.

Daily maximum and minimum screen temperatures derived from the MAD data sets refer to the 24 hour period 09-09Z. For stations operated by the Meteorological Office, the manuscript B forms contained day max and night min relevant to the 12 hour periods 09-21Z and 21-09Z. These were corrected to 24 hour maxima and minima using the values given in part B. The stations so corrected on the B form data set were:

up to 1956:	0154	0329	0516	1057	1273	1577	1634	2091
	2487	3024	4043	4206	4396	4757	4913	4995
	5603	5848	5872	5874	6547	6921	6989	7213
	8009	8807	8884					
up to 1954:	4248							
up to 1958:	8957.							

The procedures described in parts B and C were performed before the corrections described above had been made. The corrections were incorporated into part B, but there are discrepancies between the station lists given above and in part B. That given here is believed to be correct.

The data held on the MAD tapes had been quality controlled, but the techniques used had gradually improved with time, especially with the introduction of spatial quality control in the mid-seventies. The daily data on the MAD tapes was subjected to further quality control procedures before values derived from them were placed on the B form data set. These procedures are described in section 2. A data set containing the errors on the MAD data sets uncovered during these tests was created, and this is held on fiche and is described in Appendix 2.

Data from the manuscript B forms were keyed onto cards and quality control procedures developed to check these values are described in section 3. These differ from those devised for the MAD data because the latter is essentially a quality control of daily data, whereas no daily data in machineable form were available to check the manuscript means and extremes.

The quality control procedure developed for the MAD data is automatic and is incorporated into the programs which update the B form data set. An exception occurs when a completely rainless or sunless month occurs at a station, when details of the event have to be provided to the program. The quality control developed for the manuscript data, however, only takes the form of consistency and climatological checks which flag the data for manual correction or rejection. A description of some programs which use the B form data set, including the update program, is given in section 4.

2. Quality control applied to MAD data

A series of steps were applied in the following order.

A. Conversion errors of daily temperatures

The following errors were corrected.

(i) Non-conversion from ^{o}F to ^{o}C

(ii) Conversion from ^{o}F to ^{o}C twice

(iii) Values which had been multiplied by -1 before conversion from ^{o}F to ^{o}C.

(iv) Missing values which had been represented by 0 and then converted from ^{o}F to ^{o}C.

B. Climatological test of daily values

Daily values which exceeded certain thresholds were rejected and replaced by missing values. The thresholds were as follows:

(i) Rainfall totals less than zero or greater then 300mm.

(ii) Sunshine totals less than zero or greater than an approximate length of daylight which was calculated as:

$$12.9+\left(\frac{\text{latitude (degrees)}}{5}-5.85\right)\times \sin\left(0.5236\left(\text{month}+\frac{\text{day of month}}{\text{no. of days in month}}-3.7\right)\right)$$

This is an empirical relation based on figures extracted from the Smithsonian tables.

(iii) Daily temperatures in a month were ranked and the mean of the central 50% of observations calculated. Daily values were rejected if they departed from this 'trimmed' mean by more than

a) $20^{o}C$ for screen max.

b) $28^{o}C$ for screen min.

c) $28^{o}C$ for grass min.

d) $28^{o}C$ for concrete min.

e) $9^{o}C$ for 30cm earth temp.

f) $9^{o}C$ for 100cm earth temp.

These absolute values do not take account of seasonal changes in the skewness of temperature. The $28^{o}C$ threshold for screen min, for example, is designed to accommodate low winter temperatures such as those observed in 1981 and 1982. This means that in summer, however, temperatures of $-15^{o}C$, which are climatologically impossible, would not be detected as errors.

C. More stringent controls of daily temperature

The mean and SD of available values in a month were calculated. In general, values which departed from the mean by more than 5 SD's were rejected. For 100cm earth temperatures, however, the rejection threshold was increased to 6 SD's while screen max temperatures were rejected if

$$\text{Standardised Anomaly} + \text{anomaly (deg C)}/6.15 > 6.11$$

For typical standard deviations of daily max around $3^{o}C$, this criterion gives a rejection threshold around 4 standardised anomalies, but this increases to 5 standardised anomalies if the SD is as low as $1.7^{o}C$.

D. Calculations of monthly means or totals and SD

These were not calculated if either

(i) the number of missing values exceeded 5 or

(ii) the number of consecutive missing values exceeded 2.

For the purpose of calculating monthly means or totals and S D., missing daily values were replaced by the means of the values on the day before and the day after. If the missing value(s) occurred at the beginning (or end) of the month only the value from the day after (or before) was used.

Identical daily values of an element in a month are detected by an SD of zero and are rejected. The condition is usually associated with a series of zeros which were intended to represent missing values. Occasionally, however, all days in a month may be rainless or sunless. These correct values may be retained by supplying details of the event on cards. This is the only part of the quality control routine which requires manual intervention.

E. Monthly extremes

These were extracted from the data only if there was no more than one missing value from the original daily data during the month.

F. Number of days with weather

Monthly totals of these were only included if the criteria for calculating monthly totals or means was satisfied. The interpolated daily values as described in D were used as well as the original observations.

3. Quality control applied to manuscript data

The following consistency and climatological checks were applied to the monthly means, totals or extremes which had been punched onto cards:-

(i) Annual values equal to either the sum or the mean of the 12 monthly values.

(ii) Maximum temperatures higher than minimum temperatures.

(iii) Monthly maximum and minimum temperatures more extreme than the mean daily maximum and minimum.

(iv) Earth temperatures lying between the mean daily maximum and minimum temperatures.

(v) Number of days of certain phenomena not exceeding certain limits. These were:-

a)	rain days	No. of days in month
b)	wet days	21
c)	sleet or snow	15 (but 0 from June to August)
d)	snow lying	No. of days in month (but 0 from May to September
e)	hail, thunder	5
f)	fog	6
g)	gale	7
h)	screen frost	21 from Dec to Feb, 0 from June to Aug, and 7 otherwise
i)	ground frost	25 from Dec to Feb, 0 from June to Aug, and 10 otherwise.

Data which were flagged were checked against the original data for correction. Some missing values which were represented by zero rather then -32768 had to be rejected. If they were temperatures they would have been converted to -17.77°C.

4. Software

Programs for updating the B form data set are described in Appendix 3. These process data from the DMWR data set and incorporate the quality control routines applied to MAD sets. These are automatic except for the case of a completely rainless or sunless month at a station. Details of such occasions should be provided to the program on data cards.

Some other programs which process the B form data are described in Appendix 4. Their main functions are as follows:-

CBFMPRST - Prints data and averages for specified elements, stations, and years

CBFMPREL - Produces fiche output of data and averages for specified elements for all stations in the period 1951-80

CBFMMISVA - Prints number of missing values for specified elements at all stations in the period 1951-80

CBFMSTYR - Prints a table giving the number of stations opening and closing in any year.

These programs call subroutines originally written in Met O code, and notes describing these are included as Appendix 5.

Appendix 1 - Description of the B-Form data set

DSN = MØ3.CBFORM3

There are 977 stations in the B-Form data set but as subsequent years are added, the no of stations will increase.

The index or header block extends over eight blocks and is followed by the data, each block of which consists of 12 monthly values of 70 indices. They are basically month means (or sums), extreme monthly values with dates and standard deviations for various parameters as well as no of days of occurrence of certain weather conditions.

Format of Header Record in B-Form Data Set

This header record takes up 8 blocks i.e. 0-7.

Preliminary Items

1. NOP Number of preliminary items = 16.
2. NOU Total number of stations (977).
3. NIR Number of items in station index record = 4.
4. NOF Accumulative total of stations within current and preceeding blocks (if NOF = NOU index is complete).
5. No of blocks of data in data set.
6. Last year of update.
7. Date of last update (century day).
8. Sequence no of update.
9. 1st DCNN
10. Last DCNN.
11.)
12.) Spare
13.)
14.)
15. Block no of header record (= 0).
16. NVLB.

Main Section (Index Rewards) - 4 items for each station

1. DCNN no.
2. 1st Year for station
3. Last Year for station.
4. Block no of 1st Year.

Format of Data Blocks in B-Form Data Set

Preliminary Items

1. NOP Number of Preliminary items = 24.

2. NOU Number of Unit Records = 12 (months).

3. NIR Number of items in each unit record = 70.

4. NOF Number of items in fixed part of record = 70.

5. No of monthly values in particular year.

6. DCNN no.

7. Year.

8. Latitude (minutes).

9. Longitude (minutes).

10. NGRE - easting.

11. NGRN - northing

12. Altitude (metres).

13. 1st Year.

14. Last Year.

15.)
)
)
16.)
)
)
17.)

18.)
19.)
20.) Station Name.
21.)
22.)

23. Block no.

24. QCDN - blank.

Unit Record — Monthly Data

Item No	Element	Units
1	Mean maximum air temperature	0.01°C
2	Highest maximum air temperature	0.01°C
3	Date(s) of highest	
4		
5	Standard deviation of maximum air temperature	0.01°C
6	Mean minimum air temperature	0.01°C
7	Lowest minimum air temperature	0.01°C
8	Date(s) of lowest	
9		
10	Standard deviation	0.01°C
11	Mean grass minimum temperature	0.01°C
12	Lowest grass minimum temperature	0.01°C
13	Date(s) of lowest	
14		
15	Standard deviation	0.01°C
16	Mean concrete minimum temperature	0.01°C
17	Lowest concrete minimum temperature	0.01°C
18	Date(s) of lowest	
19		
20	Standard deviation	0.01°C
21	Total rainfall for the month	0.1 mm
22	Highest daily rainfall	0.1 mm
23	Date(s) of highest	
24		
25	Standard deviation of daily rainfall	0.01 mm
26	Total sunshine for the month	0.1 hr
27	Highest daily sunshine	0.1 hr
28	Date(s) of highest	
29		
30	Standard deviation of daily sunshine	0.01 hr
31	Mean 10 cm earth temperature	0.01°C
32	Lowest 10 cm earth temperature	0.01°C
33	Date(s)	
34		
35	Standard deviation	0.01°C
36	Mean 20 cm earth temperature	0.01°C
37	Lowest 20 cm earth temperature	0.01°C
38	Date(s)	
39		
40	Standard deviation	0.01°C
41	Mean 30 cm earth temperature	0.01°C
42	Lowest 30 cm earth temperature	0.01°C
43	Date(s)	
44		
45	Standard deviation	0.01°C
46	Mean 100 cm earth temperature	0.01°C
47	Lowest 100 cm earth temperature	0.01°C
48	Date(s)	
49		
50	Standard deviation	0.01°C

51	Mean air temperature	0.01°C
52	Lowest maximum air temperature	0.01°C
53 54	Date(s)	
55	Highest minimum air temperature	0.01°C
56 57	Date(s)	
	Days of:-	
58	0.2 mm or more of rain	
59	1.0 mm or more of rain	
60	Snow with or without sleet	
61	Sleet but not snow	
62	Snow lying at 09 hr	
63	Hail with or without ice pellets	
64	Ice pellets but not hail	
65	Thunder	
66	Fog at 09 hr	
67	Air temperature less than 0°C	
68	Grass temperature less than 0°C	
69	Concrete temperature less than 0°C	
70	Gale.	

APPENDIX 2

ERRORS ON THE CLIMATOLOGICAL DAILY (MAD) DATA SETS

These errors where uncovered when the MAD daily data was being quality controlled as it was been meaned to form the monthly B-Form data set. Then the daily faults were modified if possible or ignored in the monthly mean calculation, as described in part A of the B-Form data set (i.e. the original data and its quality control). More recently two data sets containing details about these errors have been formed.

1. DSN = MO3.CBERROR) both on disk
2. DSN = MO3.CBERRØ1) METØ38

On the first, the stations appear in the same order as on the MAD tapes, whilst on the second, the stations are arranged in ascending order of DCNN.

For each error there is a record containing 10 values which have been written with format (1X,10I8) and therefore can be accessed using such a format. These 10 are:-

1. DCNN
2. YEAR
3. MONTH
4. DAY
5. ELEMENT
6. VALUE IN ERROR
7. ANOMALY W.R.T. MONTH
8. MONTHLY MEAN
9. MONTHLY STANDARD DEVIATION
10. STANDARDISED ANOMALY W.R.T. MONTH

Only values out of the ten in a record are included that are relevant in deciding whether the daily value is in error e.g. if daily values for a particular element are in error for a whole calendar month, the day is left blank (i.e. -32768). Similarly so are the anomaly, month mean, SD, or standardised anomaly if any of them have not been used or needed for evaluating whether the daily value in question is in error.

Each station opens and closes with a record giving the DCNN and the year and month of opening and closing respectively of that station on the MAD data set. Also (but only on MØ3.CBERRØ1) the first record also includes the VOL of the tape and the LABEL where that station occurs on the tape, in the 9th and 10th positions respectively on the record. Therefore when a station has no errors, there are still two records for it, so that it can be shown quite easily whether any one particular stations has any errors or not.

As well as the errors uncovered by quality control, 19 stations were found to be duplicated. They are 1361, 3007, 3534, 4453, 4662, 4854, 5056, 5370, 5545, 5552,

5578, 5579, 5583, 5603, 5647, 6186, 7307, 8477, 8692. The two versions of a particular station do not always cover the same period and in the case of station of DCNN 1361, one version has two more errors than the other.

In the case of DCNN 3534, one version occurs on data set DSN = MC.DAILY. N1466 which is on tape VOL = 501117, LABEL = 26. The actual station DCNN 1466 (i.e. Pitlochry) does not appear to exist anywhere on the MAD tapes.

A microfiche output has been produced of these errors in ascending order of DCNN. A station which appears twice has a * before its DCNN no.

P Collison
Met O 3
3 March 1983

APPENDIX 3

B-Form Data Set - Annual Update

This takes place in two stages:-

1) Actual construction of the data for one particular year onto a small data-set (DSN = MO3.CBFMYY) on disk. This processes daily data from the DMWR data-set. The program used is CBFNY.

2) Merging that particular year's data onto the existing B-form data set. There are two different possibilities here.

a) The year that has just been created is a new year or a repeat of the latest year on the B-form data set. In the latter case, the data for the last year is replaced by the newly processed data. The program used is CADNY.

b) The year in question is the latest year or one earlier than the latest year on the B-form data set. Again the newly created data replaces the data already there for that year. The program used is CINNY.

Although a) will happen most often, b) will be done if a past year needs to be repeated because extra quality control has been performed on the DMWR daily data for that year.

The annual update can be done for the current year even when that year has not yet ended. All the months up to the one before the present one will be processed and the remaining months filled with -32768 as missing values.

In stage 1), daily values that fail the quality control are printed together with details of DCNN, month and element no (as it is with DMWR daily sets) and also whatever of anomaly, monthly mean, standard deviation, and standardised anomaly are relevant for that particular error. This is followed by a printout of all daily values for that particular month, first in cronological order and then in order of ascending values.

When all the daily values within a month are equal (eg all zero) this case is printed, but then rejected for inclusion into the B-form data set. However there are occasions when the rainfall total for a month is genuinely zero. When such a case(s) occurs it can be arranged for that case(s) to be included into the B-form data set. This is done by reading in a data card(s) giving the DCNN, month, and element no (as on B-form data set) in format 3I5.

The data sets DSN is MO3.CBFORMYY where YY is the latest year that has been added to it (e.g. 83 for 1983). It resides on a 6250 tape since an 1600 one is too small. Whenever an update (or amendment to a particular year) is made, the new data set has to be copied to a different tape.

Program CBFNY Source: MO3.RSRCELIB
Object: MO3.OBJLIB

Purpose To form data for the B-form data set for one particular year and place it on data set DSN = MO3.CBFMNY.

Method Daily data from the DMWR data set is meaned (or summed) over a whole month. Quality control is performed on this daily data (as described in the write-up on the B-form data set - Part A) before the means etc are calculated.

J.C.L (for 1983)

The JOB card is followed by:-

```
//JOBLIB DD DSN=M22.LOADLIB,DISP=SHR
//EXEC FORTVLG,TIME.GO=4,GOREGN=192K
//LKED.ADLOB DD DSN=M22.LOADLIB,DISP=SHR
//LKED.OBJO3 DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.MPGLIB DD DSN=MET.PROGLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE ADLOB (AGPRW,MWRIT)
      INCLUDE OBJO3 (KIRODD,C3,CBFNY,GSTNDTL)
      INCLUDE MPGLIB(IS2DAY,SORTI,CHARS,MOVECH,VNEWMARK,VDATES,YEARDAY)
//GO.FT60F001 DD SYSOUT=X,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=931)
//GO.FT61F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=931)
//GO.ARCHIV10 DD DSN=MP.DMWR.Y83,DISP=SHR
//GO.MWRITS98 DD DSN=MO3.CBFMNY,DISP=(OLD,KEEP),
//   DCB=(RECFM=F,LRECL=1728,BLKSIZE=1728)
//GO.ARCHIV99 DD DSN=MO3.CBFMNY,DISP=(OLD,KEEP),
//   DCB=(RECFM=F,LRECL=1728,BLKSIZE=1728)
//GO.SYSIN DD *
```

Blank card, or data card(s) giving DCNN, month, and element no (format 3I5).

```
//
```


Program CADNY Source: MO3.RSRCELIB
Object: MO3.OBJLIB

Purpose To add a new year of B-Form data (which has been generated by CBFNY) onto the B-Form data set from data set DSN=MO3.CBFMNY. Also the latest year on the B-form data set can be replaced by a later version of it. This happens if the new version has more months to it or has had more quality control performed on it.

J.C.L (for 1983)

The JOB card is followed by:-

```
// EXEC FORTVLG,GOREGN=192K,TIME.GO=2
//LKED.MPGLIB DD DSN=MET.PROGLIB,DISP=SHR
//LKED.METQ DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE MPGLIB(GPACCESS,TPACCESS,MWRIT,MOVECH,VDATES,YEARDY,IS2DAY)
      INCLUDE METQ(C23,CADNY)
//GO.ARCHIV09 DD DSN=MO3.CBFORM82,DISP=SHR,
// UNIT=T6250,VOL=SER=030147,LABEL=(1,,,IN),DCB=DEN=4
//GO.ARCHIV10 DD DSN=MO3.CBFMNY,DISP=SHR
//GO.ARCHIV11 DD DSN=MO3.CBFORM83,DISP=(NEW,KEEP),
// UNIT=T6250,VOL=SER=030148,LABEL=1,
// DCB=(RECFM=F,LRECL=1728,BLKSIZE=1728,DEN=4)
//
```

Program CINNY Source: MO3.RSCELIB
Object: MO3.OBJLIB

Purpose To insert a years B-form data into the general B-form data set from MO3.CBFMNY, thus replacing what is already on for that year. The year in question is not the latest on the B-form data set, but is being put on again because extra quality control has been performed on the original DMWR daily data.

If this year is the latest on the data set CADNY must be used instead of CINNY.

J.C.L (for 1982)

The JOB card is followed by:-

```
// EXEC FORTVLG,TIME.GO=2
//LKED.MPGLIB DD DSN=MET.PROGLIB,DISP=SHR
//LKED.OBJO3 DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD
      INCLUDE MPGLIB (GPACCESS,MREAD,MWRIT,MOVECH)
      INCLUDE OBJO3 (CINNY)
//GO.MREADS09 DD DSN=MO3.CBFORM83,DISP=SHR,
// UNIT=T6250,VOL=SER=030147,DCB=DEN=4
//GO.ARCHIV10 DD DSN=MO3.CBFMNY,DISP=SHR
//GO.MWRITS11 DD DSN=MO3.CBFORM83,DISP=(NEW,KEEP),
// UNIT=T6250,VOL=SER=030148,LABEL=1,
// DCB=(RECFM=F,LRECL=1728,BLKSIZE=1728,DEN=4)
//
```


APPENDIX 4

Program CBFMPRST Source: MØ3.RSCELIB
Object: MØ3.OBJLIB

Purpose

1. Access monthly mean climatological data from B-Form data set.

2. Calculate means, standard deviations, and extremes over all the years that were accessed.

Method of Use

The following data cards are required

1. A card with a suitable title (or blank card). If more than one element is wanted, they must all be mentioned on this single title card.

2. A card is required for each station giving DCNN, first year, last year, and element no(s) (as described in the write up of the B-form data set). A maximum of 13 elements is allowed, enough to fill one data card and the format is 16 I5.

If only the means, standard deviations, and extremes are wanted, punch a negative sign before the DCNN.

When only one years data is needed, the space for the last year can be left blank. If both the first year and last year on the data card are left blank, this implies that all years present on the B-form data set is needed. When years are asked for that don't exist for the particular station, adjustments will be made to either start at the beginning or finish at the end of the data for that station.

If the element no is left blank, a 12 x 70 matrix containing all elements for the 12 months of the year is printed. However in this case the units remain the same as they are in the B-form data set (eg mean monthly temperatures are printed as whole numbers in 1/100 ths of a degree C instead of °C as they are for the usual cases).

If the difference between two elements is wanted, the two element nos are punched together (eg for mean maximum minus mean minimum temperature, the element no punched is 106 to represent element 1 minus element 6).

If the station asked for does not exist on the B-form data set, or the years asked for, for a particular station be totally outside the range that exists, the appropriate error message will be printed, and then computation will proceed on the next station.

Example of Use

```
// EXEC FORTVLG
.
//LKED.MET. DD DSN=MET.PROGLIB,DISP=SHR
//LKED.METR DD DSN=MØ3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *

      INCLUDE MET. (GPACCESS)
      INCLUDE METR (CBFMPRST,C13,C11,C17)
//GO.ARCHIV10 DD DSN=MO3.CBFORM83,DISP=SHR,
// UNIT=DISK,VOL=SER=MET048
```

```
//GO.SYSIN DD *
MEAN MONTHLY MAX TEMPERATURE, RANGE, OR RAINFALL
 1646 1971 1980    1
 2007 1961 1974   21
-2194 1951 1980    1
 5457 1970         1   21
 5476
 5758 1961 1980  106
```

A version of the B-Form data set ie DSN=MO3.CBFORM81 which goes up to 1981 exists on tape 030148 (the disk version only goes up to 1980). In this case use TGACCESS instead of GPACCESS with the INCLUDE METQ and also use
// UNIT=T6250,VOL=SER=030148,DEN=4
Also when using a tape version it is advisable to have the cards in ascending order of DCNN.

A version of the B-form data set including 1982 will soon exist.

P Collison
Met O 3
April 1983

Program CBFMPREL — Source: MO3.RSRCELIB

Object: MO3.OBJLIB

Purpose

For specified element(s) at every station on the B-form dataset.

1. Print out monthly means or totals for each year from 1951 to 1980 and also either annual means or totals whichever is appropriate for the particular element.

2. Calculate averages for each month and annual over all years present in the period 1951-80. Standard deviations are also calculated and the averages, S.D., maximum and minimum with the year of each of the latter two are printed.

Method

A data card is fed in giving the element no(s) in format 16I5. Each stations data takes up one page so it is more usual to output to microfiche. A maximum of 16 elements can be outputted in one job run.

The difference between two elements can also be produced. In this case the no of element being subtracted from, is multiplied by 100 and added to the other element.

e.g. mean daily maximum minus minimum temperature (ie element 1 minus element 6) is represented by 106 on the data card.

JCL

```
// EXEC FORTVLG
//LKED.METQ DD DSN=MET.PROGLIB,DISP=SHR
//LKED.STPUT DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
   INCLUDE METQ (GPACCESS,MOVECH)
   INCLUDE STPUT (GSTNDTL,CBFMPREL,C13,C11,C1,C17)
//GO.FTØ6FØØ1 DD SYSOUT=M,DCB=(RECFM=FBA,LREC=133,BLK SIZE=1330)
//GO.ARCHIVIØ DD DSN=MO3.CBFORM3,DISP=SHR
//GO.FT99FØØ1 DD DSN=ML.CLIMASTR,DISP=SHR
//GO.SYSIN DD *
    2   67  611
//
```

In this example of data card, 2 stands for extreme maximum temperature, 67 - no of days of air frost, and 611 - mean daily minimum minus mean daily grass minimum temperature.

One element takes about 25 units on the computer.

P Collison
Met O 3
October 1983

Program CBFMISVA Source: MO3.RSRCELIB

Object: MO3.ROBJLIB

Purpose Evaluate the number of missing monthly values for a particular element(s) for each station in the B-form data set during the period 1951 to 1980.

Results The results are printed out in ascending order of DCNN, one station to a line, and fall into three sections.

1) Total number of missing values for each year 1951 to 1980.

2) Total number of missing values for each calendar month.

3) Overall number of missing monthly values and number of years with all or part of the values missing.

Method A data card is read in giving the element number(s) as on the B-form data set (ie 1 to 70) in format 2613.

If the elements needed are monthly means, ie element nos 1, 6, 11, 16, 21, 26, 31, 36, 41, 46, or 51, it is possible to use instead -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, or -11 as element numbers on the data card.

JCL After JOB card there follows:-

```
// EXEC FORTVLG
//LKED.INPUT DD DSN=MET.PROGLIB,DISP=SHR
//LKED.ROBJ03 DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE INPUT(GPACCESS,MOVECH)
     INCLUDE ROBJ03(CBFMISVA)
//GO.ARCHIV10 DD DSN=MO3.CBFORM3,DISP=SHR
//GO.FT60F001 DD SYSOUT=X,DCB=(RECFM=FBA,LRECL=151,BLKSIZE=1510)
//GO.SYSIN DD *
     60 05 -3 -4 (for example)
//
```

Program CBFMSTYR

Source: MO3.RSRCELIB
Object: MO3.ROBJLIB

Purpose For the stations in the B-Form data set ie -

1) Prints out in tabular form the no of stations that start and finish at all possible combinations of years.

2) Prints out on the extreme right hand column the no of stations that exist for each year in turn.

This program adapts itself to whatever is the final year on the data-set. It operates by processing the header block which is an index of all the stations giving also the first and last year for each station.

Examples

(1) Find the no of stations which started in 1959 and finished in 1978.

Run the eye down the extreme left hand column (or next but one extreme right hand one) to 1959. Similarly run the eye along the top or bottom row to 78. The point of intersection of the row at 1959 and column at 78 gives the answer 11.

2) Find how many stations were running during 1971.

Run the eye down the next but one extreme right hand column till 1971 is reached. The answer of 637 is in the extreme right hand column.

3) Find the total no of stations which cover the period 1951 to 1980.

Find the point of intersection from 1951 on the left hand side and 80 at the bottom (as in example 1). Construct a rectangle with this point as the bottom left hand corner and extending over the rest of the grid. Total the values within this rectangle. This gives 170 as the answer.

J.C.L.

After the JOB card comes:-

```
//JOBLIB DD DSN=M22.LOADLIB,DISP=SHR
//  EXEC FORTVLG
//LKED.ADLOB DD DSN=M22.LOADLIB,DISP=SHR
//LKED.ROBJ03 DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED SYSIN DD *
```

```
    INCLUDE ADLOB (GPA)
    INCLUDE ROBJ03(CBFMSTYR)
//GO.ARCHIV10 DD DSN=M03.CBFORM83,DISP=SHR,
//  UNIT=T6250,VOL=SER=841527,DCB=DEN=4
//
```


APPENDIX 5

MET O 13 D P Section

TECHNICAL NOTE NO.9

SUBROUTINES FROM METCODE

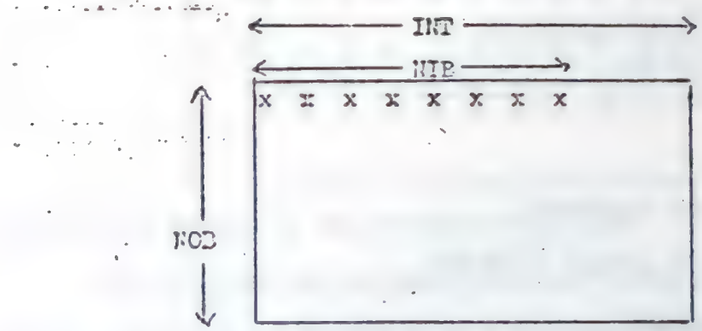
P R Bennell

Entry name: S1

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Computation of count, sum and means, blockwise or row-wise of a floating point matrix of data as described below,



Method of use: Called by the standard CALL macro

CALL S1(array,int,nib,nob,result,intr,threshold,missing)

where 'array' is the beginning of a row that requires processing, ie it can be any array element, eg ARRAY (5,2) would process columns 5 onwards of each row starting at row 2. It is not necessary to have two dimension, once dimension will work likewise but the layout of matrices would be the programmer's responsibility. The matrix would be 'int' by 'nob' words.

'int' is a full word integer constant or variable giving the number of columns or words in each row of the matrix, ie the maximum of the first subscript of the two dimension array. Note this can be negative maximum but 'array' must not point to the beginning of an array.

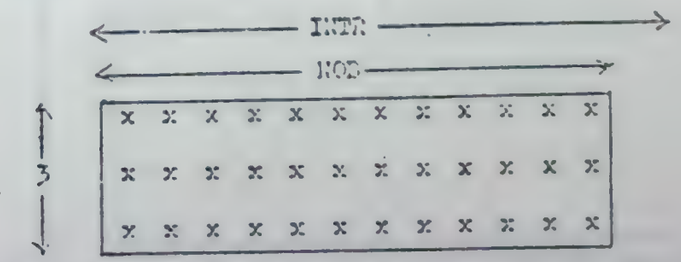
'nib' is a full word integer constant or variable giving the number of words or columns in each row, starting from the first column defined by 'array', that are to be counted, summed and meaned.

'nob' is a full word integer constant or variable giving the number of blocks of data or rows that are to be processed.
Note that the maximum value need not be the second subscript maximum of the two dimension array but also must not be greater than it.

'result' is the beginning of a row of a floating point matrix where the counts of data in the rows data defined by 'array', 'int', 'nib', 'nob' are to be stored. The number of words would be the same as 'nob'. The next two rows would contain the sums and means

'intr' is a full word integer constant or variable giving the number of columns or words in the resulting matrix, ie the maximum value of the first subscript.

ie



'intr' may be set to negative maximum, causing the means, sums and

counts to be put in that order, or set to zero in which case only means would be computed. In the case of negative maximum, 'result' must not be the beginning of an array.

'threshold' is a full word integer constant or variable giving the threshold which allows the mean to be replaced by a missing observation whenever the number of genuine data given by the count is too small.

'missing' is a full word floating point constant or variable giving the missing observation value in the data eg -32768

eg To process columns 5 to 20, and rows 2 to 30 of the array DATA dimensioned as follows

```
DIMENSION DATA(25,50),RES(29,3)
```

the call statement might be

```
CALL S1(DATA(5,2),25,16,29,RES,29,10,-32768.Ø)
```

J.C.L. requirements:

The following J.C.L. cards are required,

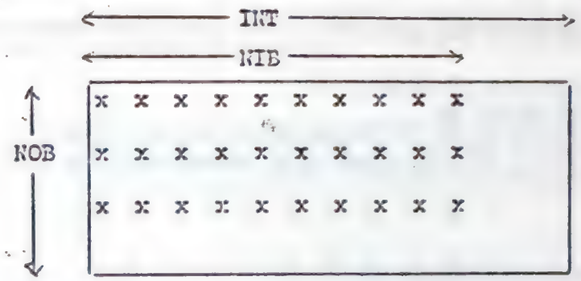
```
//LKED.DDNAME DD DSN=M13.OBJLIB, DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Computation of means, standard deviations, skewness and kurtosis, blockwise or row-wise, of a floating point matrix of data as described below



Method use: Called by the standard CALL macro

```
CALL S3(array,int,nib,nob,result,intr,k,missing)
```

where 'array' is the beginning of a row that requires processing, ie it can be any array element eg ARRAY (5,2) would process columns 5 onwards of each row starting at row 2. It is not necessary to have two dimension, one dimension will work likewise but the layout of matrices would be the programmer's responsibility. The matrix would be 'int' by 'nob' words.

'int' is a full word integer constant or variable giving the number of columns or words in each row of the matrix. ie the maximum of the first subscript of the two dimension array. Note this can be negative maximum but 'array' must not point to the beginning of an array.

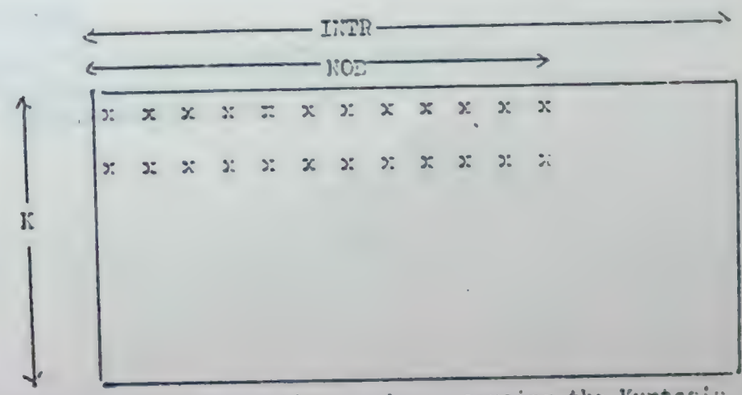
'nib' is a full word integer constant or variable giving the number of words or columns in each row, starting from the first column defined by 'array', that are to be meaned, etc.

'nob' is a full word integer constant or variable giving the number of blocks of data or rows that are to be processed. Note that the maximum value need not be the second subscript maximum of the two dimension array but also must not be greater than it.

'result' is the beginning of a row of a floating point matrix where the means of data in the rows defined by 'array', 'int', 'nib', and 'nob' are to be stored. The number of words or columns would be the same as 'nob'. The next three rows would contain the standard deviation, skewness and kurtosis.

'intr' is a full word integer constant or variable giving the number of columns or words in the resulting matrix, ie the maximum value of the first subscript

ie



'intr' may be set to negative maximum, causing the Kurtosis, skewness, or standard deviation to be in the first row, depending on the setting of 'k'. If 'intr' is set to negative,'result' must not be the beginning

of an array.
'k' is a full word integer constant or variable which when given the number,
2, two rows of results will be produced ie mean and standard deviation
3, three rows of results will be produced ie mean, standard deviation and skewness
4, four rows of results will be produced with mean, standard deviation skewness and kurtosis
'missing' is a full word floating point constant or variable giving the 'missing observation' value in the data.

eg to process columns 5 to 20, and rows 2 to 30 of the array DATA dimensioned as follows,

```
DIMENSION DATA(25,50),RES(29,3)
```

the CALL statement might be

```
CALL S3 (DATA(5,2),25,16,29,RES(1,3),-29,3,-32768.Ø)
```

three rows of results, ie skewness, s.d, means would be produced.

J.C.L requirements:

The following J.C.L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

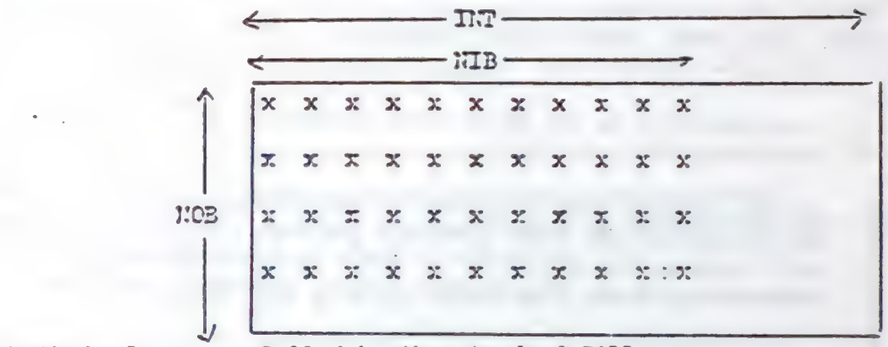
P R Benwell
Met O 13

Entry name: S5

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Replacement of data by anomalies, blockwise or row-wise, in a floating point matrix as described below,



Method of use: Called by the standard CALL macro

```
CALL S5(array1,int,nib,nob,array 2,missing)
```

where 'array1' is the beginning of a row that requires processing, ie it can be can be any array element, eg ARRAY (5,2) would process anomalies for columns 5 onwards, on row 2 from the first normal, on row 3 from the second normal etc.
'int')
'nib') as details in subroutine S1
'nob')
'array2' is the beginning of an array of 'nob' words which contain the normals
'missing' is a full word floating point constant or variable giving the missing observation value in the data to enable such data to be ignored in the anomaly computations.

eg To compute anomalies in columns 2 to 8, and rows 2 to 10 of the array ACTUAL dimensioned as follows

```
DIMENSION ACTUAL (25,50), ANORMS (9)
```

the CALL statement might be

```
CALL S5(ACTUAL(2,2),25,7,9,ANORMS,-32768.Ø)
```

J.C.L requirements

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Entry name: S7

Category of use: Fortran and Assembler programmers

Type: Subroutine

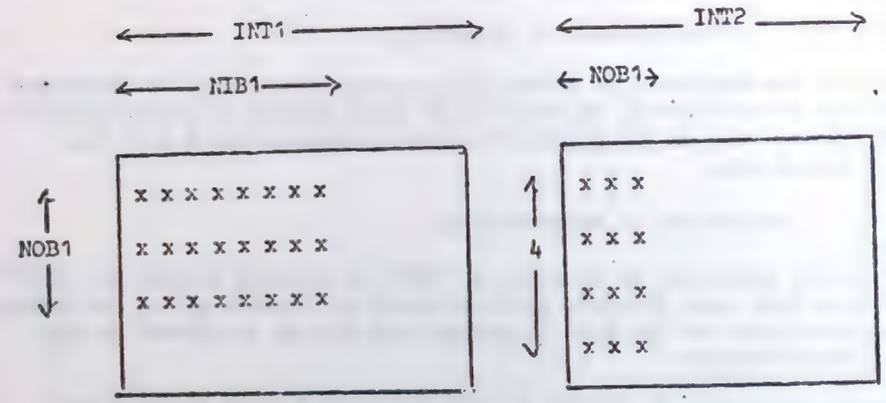
Purpose: produces maximum and minimum values from a floating point array with positions, blockwise or rowwise.

Method of use: Called by the standard CALL macro

CALL S7 (array1, int1, nib1, nob1, array2, int2, missing)

where 'array1'
'int1'
'nib1'
'nob1'
'array2' is the initial word or column in the initial row that is to be filled in with 'nob1' maximum values. The next three rows will contain the positions in their respective rows of the maximum positions, the minimum values and their positions.

ie



'int2' is a full word integer or constant giving the number of columns or words in each row of the resulting matrix or array, ie the maximum of the first subscript of the two dimension array. Note negative maximum will do backward placing of the rows of results when 'array2' is not the beginning of the array.

'missing' is a full word floating point constant or variable giving 'missing observations' to enable only genuine data to be taken into account.

J C L requirements:

The following J C L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(NAMES)
```

P R Benwell
Met O 13

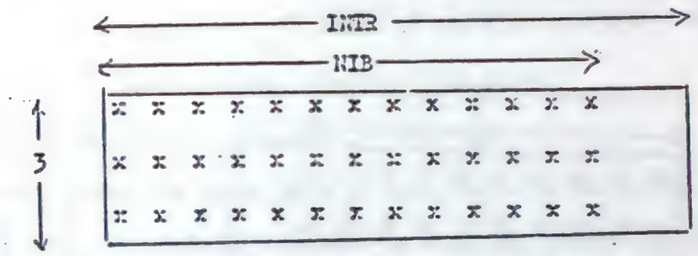
Entry name: S11

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Computation of count, sum, and means, itemwise or column-wise of a floating point matrix of data

Method of use: Details are the same as subroutine S1, except that counts sums and means are computed column-wise, ie data in each column are to be counted, summed and meaned. The results would be arranged as follows



J.C.L requirements

The following J.C.L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(NAMES)
```

P R Benwell
Met O 13

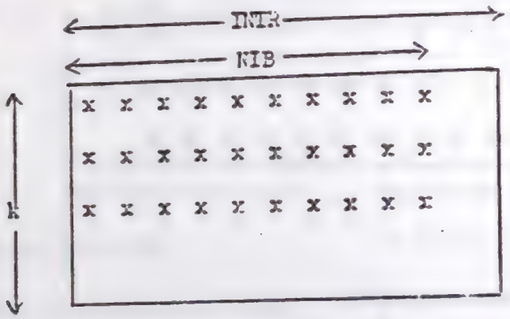
Entry name: S13

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Computation of means, standard deviation, skewness and kurtosis, itemwise or column-wise, of a floating point matrix of data

Method of use: Details are the same as subroutine S3, except that means, standard deviations, skewness and kurtosis are computed column-wise, ie data in each column are to be meaned etc.
The results would be arranged as follows,



J.C.L requirements

The following J.C.L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

P R Bennett
Met O 15

Entry name: S34

Category of use: Fortan and Assembler programmers

Type: Subroutine

Purpose: Orthodox harmonic analysis of floating point data, and storage of $a_0, a_1, b_1, a_2, b_2, \ldots a_m, b_m$ up to the mth harmonic, where a_0 is the mean of the data, a_m is the cosine coefficient of the mth harmonic, and b_m is the sine coefficient of the mth harmonic ie

$$Y_{te} = a_0 + a_1 \cos \theta t + b_1 \sin \theta t + a_2 \cos 2\theta t + b_2 \sin 2\theta t + \ldots\ldots$$

where $\theta = \frac{2\pi}{N}$ and t is the time variate.

Method of use: Called by the standard CALL macro

CALL S34 (array, n,m,results, i, missing)

where 'array' gives the first word of the array containing the floating point data
'n' is a full word integer constant or variable giving the number of data in the array to be analysed.
'm' is a full word integer constant or variable giving the number of harmonics to be used.
'results' gives the first word of a floating point array where the results are to be stored. Results will be stored in the form,
$a_0, p, a_1, b_1, a_2, b_2 \ldots\ldots a_m, b_m$

where $p = 2 * m + 2$
'i' is a full word integer constant or variable. i=0 will enable the data to be treated as instantaneous values, otherwise they will be treated as averages over the time interval.

ie $a_m = \frac{a_m * N * \pi/2}{\sin(N * \pi/2)}$ likewise with b_m

'missing' is a full word floating point constant or variable giving the 'missing observation' value, eg-32768,. This enables data that are missing observations to be ignored in the analysis.

J.C.L requirements

The following J.C.L cards are required.

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

Entry name: S35

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Harmonic analysis of 12 monthly values using a table of 60 coefficients as given in Meteorological Research Publication No 917 taking into account the differing lengths of the months. The number of harmonics used is 2.

Method of use: Called by the standard CALL macro

CALL S35(array,results,missing)

where 'array' gives the first word of the array containing the 12 monthly floating point data.

'results' gives the first word of a floating point array where the results are to be stored. Results will be stored in the form.

a_0,missing, a_1, b_1, a_2, b_2

'missing' is a full word floating point constant or variable giving the missing observation value, eg -32768. This enables the second result value to be filled in correctly for Subroutine S36 to operate.

J.C.L requirements:

The following J.C.L cards are required

```
//LKED.DDNAME DD DSN=M13.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Entry name: S36

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Harmonic synthesis of results as produced by subroutine S34 (or data in the same form)

Method of use: Called by the standard CALL macro

CALL S36 (array1,m,n,array2,i,a,b,missing)

where 'array1' is the first word of a floating point array containing the harmonic analysis results from S34 or S35 subroutines. Note that if the second word contains a missing observation value, two term harmonic analysis will take place.

'm' is a full word integer constant or variable giving the number of harmonics

'n' is a full word integer constant or variable giving the number of resulting synthesised data required.

'array2' is the first word of a floating point array where the resulting data are to be stored.

'i' is a full word integer constant or variable. If i=0, the results are instantaneous values, otherwise values are meaned over intervals centred on the angle concerned.

'a' and 'b' are also full word integer constants or variables.
a/b is the initial offset expressed as a fraction of the interval 1/n (eg for results corresponding to the mid-points of the intervals, a/b = 1/2)

'missing' is a full word floating point constant or variable giving the missing observation value eg -32768. See details of 'array1' for this parameter's use.

J.C.L requirements:

The following J.C.L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB DISP=SHR
//LKED.SYSIN DD *
     INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Entry name: X10

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: To output Synoptic Climatology grid point data onto computer printout chart 14 (polar stereographic projection in isopleth/Zebra on scale 1: 50,000,000 *). The data are assumed to be in form a floating point matrix 16 by 36 words. The first row (of 16 words) gives data at the Greenwich Meridian. The remaining 35 rows give data at ten degree longitudes starting at 10 degrees East and ending at 10 degrees West. The first column is not used except for indicators, the remaining 15 columns give data at 5 degree latitudes starting at 85 degrees North and ending at 15 degrees North.

Method of use: Called by the standard CALL macro.

```
CALL X10(array,base,interval,missing,title1,title2)
```

where 'array' gives the first word of the matrix
'base' is a full word integer constant or variable giving the value of a base line.
'interval' is a full word integer constant or variable giving the interval between lines.
'missing' is a full word floating point constant or variable giving the 'missing observation' value, eg -32768. This enables areas with missing observations to be mapped out.
'title1' gives the first word of an array of characters to be printed at the head of the chart.
'title2' gives the first word of another array of characters to be printed after the previous title.
(in both titles, the first word actually contains a floating point value which is the count of characters in the title)

J.C.L requirements:

The following J.C.L cards are required.

```
//LKED. DDNAME DD DSN=M13.LOADLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(PCHARTS)
/*
//GO.FT01F001 DD DSN=M13.CHARAT,DISP=SHR,LABEL=(,,,IN)
//GO.FT08F001 DD SYSOUT=(4,,14),
//       DCB=(RECFM=FBA,LRECL=151,BLKSIZE=1510)
```

P R Benwell
Met O 13

Entry name: X12

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: To output grid point data onto computer printout Chart 14 (polar stereographic projection on scale 1:50,000,000). All data are assumed to be in floating point. Only the tens, units and tenths are printed, eg 564.3 and -64.3 are printed as 643 and -643 respectively. Overwriting of characters takes place when grid points are too close on the chart.

Method of use: Called by the standard CALL macro

```
CALL X12(array1,count,array2,title,missing)
```

where 'array1' gives the first word of the array containing pairs of latitude and longitude position (negative for east and south), occupying 2 x count words.
'count' is a full word integer constant or variable giving the number of grid points where data are to be printed
'array2' gives the first word of the array containing the grid point data.
'title' gives the first word of an array of characters to be printed at the head of the chart. The first word actually contains a floating point value which is the count of characters in the title.
'missing' is a full word floating point constant or variable giving the missing observation value, eg -32768. This enables grid points with missing observations to be printed as blanks.

J.C.L requirements

The following J.C.L cards are required.

```
//LKED.DDNAME DD DSN=M13.LOADLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(X12)
/*
//GO.FT01F001 DD DSN=M13.CHARAT,DISP=SHR,LABEL=(,,,IN)
//GO.FT08F001 DD SYSOUT=(4,,14),
//       DCB=(RECFM=FBA,LRECL=151,BLKSIZE=1510)
```

P R Benwell
Met O 13

Entry name: H11

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Copies rows of whole words (or even pairs of half words or quadruples of characters) in floating point or integer form, from one array to another array.

Method of use: Called by the standard CALL macro

CALL H11 (array1, int1, nib1, nob1, array2, int2)

where 'array1' is the initial word or column in the initial row that is to be copied to another array or location, ie it can be any array element eg ARRAY(5,2) would transfer data at columns 5 onwards in rows 2 onwards.

'int1' is a full word integer constant or variable giving the number of columns or words in each row of the matrix or array, ie the maximum of the first subscript of the two dimension array. Note this can be negative maximum to do backward copying when 'array1' is not the beginning of an array, or it can be zero, thus enabling generation of rows of data with the same values.

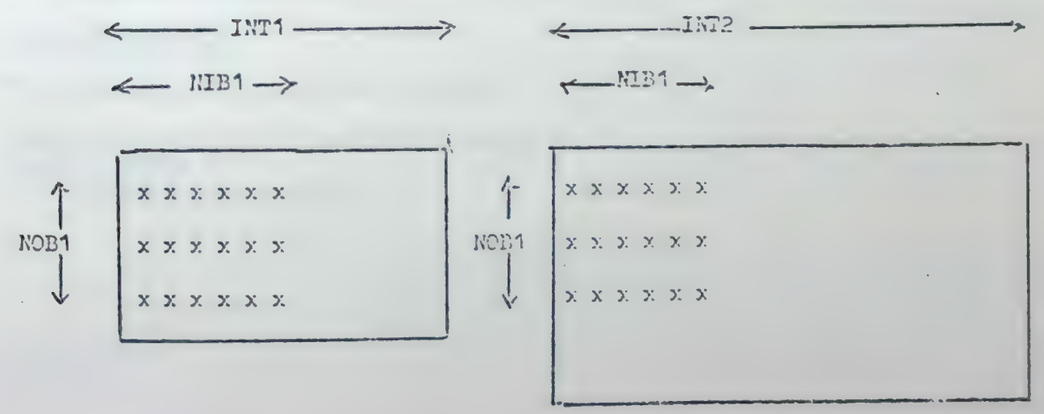
'nib1' is a full word integer constant or variable giving the number of words or columns in each row, starting from the first column defined by 'array 1', that are to be transferred.

'nob1' is a full word integer constant or variable giving the number of blocks of data or rows that are to be transferred. Note that the maximum value need not be the maximum of the second subscript of the two dimension array.

'array2' as 'array1' but for another array or location.

'int2' as 'int2' but for 'array2'.

ie

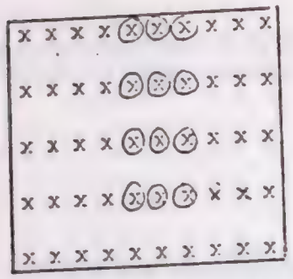


Examples:

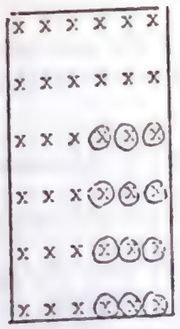
a) DIMENSION DATA (10,5), ARRAY (6,6)

CALL H11 (DATA(5,2), 10, 3, 4, ARRAY (4,3),6)

DATA



ARRAY



b) CALL H11 (DATA(10, 1, 1,5, DATA(9), -2)

DATE (10) contents tranferred to DATA (9)
(11) (7)
(12) (5)
(13) (3)
(14) (1)

J.C.L requirements:

The following J.C.L cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB, DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME (HANDS)
```

P R Benwell
Met O 13

Entry name: H15

Category of use: Fortran and Assembler programmers

Type: Subroutine

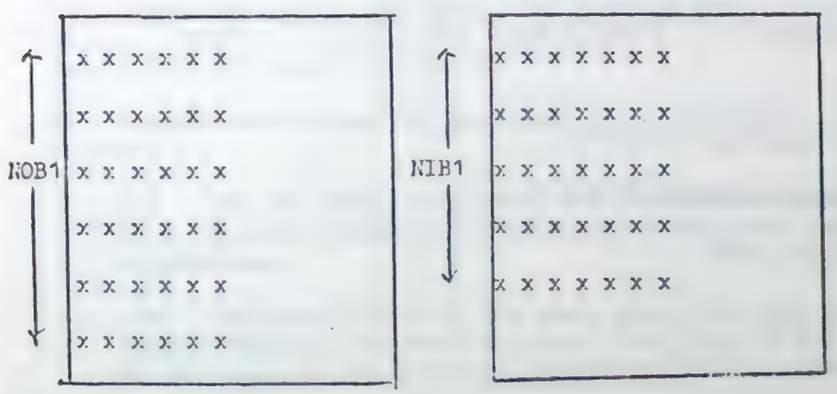
Purpose: Transposes a matrix by interchanging rows and columns.

Method of use: Called by the Standard CALL macro.

CALL H15 (array1, int1, nib1, nob1, array2, int2)

where 'array1'
1 'int1'
'nib1' are described in details of H11 subroutine
'nob1'
'array2'
'int2'

ie



J C L requirements:

The following J C L Cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB, DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Entry name: H19

Category of use: Fortran and Assembler programmers

Type: Subroutine

Purpose: Copies scaled rows of floating point whole words from one array to another.

Method of use: Called by the standard CALL macro

CALL H19 (array1, int1, nib1, nob1, array2, int2, a, b, c, d, missing)

where 'array1'
'int1' are described in details for H11
'nib1'
'nob1'

a, b, c, d are full word integer constants as variables where a/b is added to the data which is then multiplied by c/d.

eg result = $\left(\text{data} + \frac{a}{b}\right) \frac{c}{d}$

'missing' is a floating point constant or variable giving 'missing observations'
eg to convert data in degrees F to degrees C in the example for subroutine H11

CALL H19 (DATA(5,2), 10, 3, 4, ARRAY(4,3), 6, -32, 1, 5, 9, -32768.0)

J.C.L requirements:

The following J.C.L Cards are required,

```
//LKED.DDNAME DD DSN=M13.OBJLIB, DISP=SHR
//LKED.SYSIN DD *
      INCLUDE DDNAME(HANDS)
```

P R Benwell
Met O 13

Part B: Estimation of Missing Values

1. The elements examined were:-

   (i) daily and monthly maximum and minimum temperatures

   (ii) 30 cm earth temperatures

   (iii) monthly and highest daily sunshine

The values used were those held on the BFORM data set in which temperatures and sunshine were expressed in units of hundredths of a degree centigrade and tenths of an hour respectively.

2. The first step was the creation of a series of 'FOMENT' type data sets which may be regarded as a set of single parameter B form archives, and which are described in appendix 1. Only stations with greater than or equal to 10 years of data in the period 1951-80 were transferred to the new data sets. This task was performed by program M03F0046, which is described in appendix 4. Before 1959, daily means of 24 hour maximum and minimum temperatures were replaced by day max and night min at certain stations. These values were made compatible with the 24 hour extremes using methods described in appendix 2.

3. The second step, the estimation of missing values, was performed by program M03F0047 (see appendix 4). It is written round subroutine MISIN, which estimates missing values according to the 'proposed' method described in Met O 3 Tech Note 8. For the highest daily sun, additional checks were made to ensure that values did not exceed the maximum possible. The complete data, original plus estimates, are held on 'FEMENT' type data sets (see appendix 2) in which the estimated values have had 10,000 added to them.

4. A brief description of the method used to estimate missing values is as follows:

   (i) The 12 'best' neighbours are selected on the basis of their correlation with the test station after adjustments have been made according to the length of overlap.

   (ii) For every month of the year, data from each neighbour are regressed against that for the test station. The slope of the regression is set equal to the ratio of the standard deviations (ie the moderating effect of correlatio is ignored)

   (iii) To ensure a regular seasonal variation in the relations between stations the regression coefficients are smoothed over a number of months.

   (iv) Estimates for the test station are made separately from each neighbour. These are combined to form a final estimate by attaching a weight 1/i to the ith ranking neighbour.

5. Program M03F0047 estimates missing data on a regional basis in which each region comprises a group of 'averaging' and 'bordering' counties. The averaging or 'A' counties contain the stations for which estimates are to be made, while the bordering or 'B' counties contain stations which act only as neighbours to those in the 'A' counties. Details of the regions used and the arrangement of A and B counties, are given in appendix 3.

6. The quantity of data in machineable form in the period 1951-58 is much less than for later years, particularly in Scotland. A number of Scottish stations for which data is available in that period were not included on the B form data set because they were considered by Met O Edinburgh to be inhomogeneous. Estimates for the period 1951-58 will therefore be poorer than those for later years.

As an example, consider station 7623, for which data is virtually complete in the period 1957-80. None of the first 11 neighbours selected have machineable data before 1957, while the 12th neighbour has data back to 1953. Hence estimates for the period 1953 to 1956 are based on comparisons only with the 12th neighbour, while estimates for 1951 and 1952 have not been made at all. (Due to an error, missing values remaining on the FEMENT type data sets have had 10,000 added to them, and hence are represented by -22768).

Appendix 1 - MO3.FOMENT type data sets

Header Block (4 blocks long)

NOP = 6 NOU = 187 etc NIR = 2 NOF = 600 NR = 0 NVLB = 604	DCNN(1) .... DCNN (600) IBN(1) .... IBN (600)

Data Block

NOP = 20 NOU = 12 NIR = 30 NOF = 30 DCNN NAME(8) LAT(minutes) LONG NGRE NGRN NALT NR QCEN	JAN 51 JAN 52 ⋮ ⋮ ⋮ JAN 80	FEB 51 .... FEB 52 .... ⋮ ⋮ ⋮ FEB 80	.... DEC 51 .... DEC 52 ⋮ ⋮ ⋮ .... DEC 80

SPACE = (TRK,(44)), DCB = (RECFM = F, LRECL = 860, BLKSIZE = 760),
UNIT = T1600, VOL = SER = Ø3ØØ54 (back up Ø3ØØ58)

Daily min	(observed only)	MO3.FOMENT	LABEL = 21
Daily max	" "	FOMEXT	22
Monthly min	" "	FOMINT	23
Monthly max	" "	FOMAXT	24
30 cm earth	" "	FO3ØCM	25
Monthly sun	" "	FOSUNM	26
Highest daily sun	" "	FOSUNH	27

Daily min	(observed and estimates)	MO3.FEMENT	LABEL = 28
Daily max	" "	FEMEXT	29
Monthly min	" "	FEMINT	30
Monthly max	" "	FEMAXT	31
30 cm earth	" "	FE3ØCM	32
Monthly sun	" "	FESUNM	33
Highest daily sun	" "	FESUNH	34

Room for 600 stations on data set
Units = Deg C / 100 for temperature and hrs/10 for sunshine
10,000 added to estimates
On the FE data sets, missing values are represented by -22768

Appendix 2 – Correction of day max and night min to 24 hr (09–09) max and min

Met O 883 (Averages of temperature 1941–70) quotes the following figures.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
09–21 max – 09–09 max	+0.3	+0.2	+0.1	0.0	+0.1	+0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.4	+0.1
21–09 min – 09–09 min	−0.7	−0.5	−0.3	−0.1	−0.1	0.0	0.0	0.0	−0.1	−0.3	−0.6	−0.7	−0.3

These corrections were applied to the following stations (Source L.R. Walker):

Up to 1956:
0154 0516 1057 1273 1577 1634 2091 2487
3024 3626 4206 4757 4913 5848 5872 5874
6547 6921 6989 7213 8009 8807 8884 8957

Up to 1954: 6679

Up to 1958: 9905

This list of stations is believed to be incomplete.

Appendix 3 – Regions used for estimating missing values

Region 1 – Northern Scotland
A counties: 00 01 02 03 04 05 10 11 12 13 14 60 62
B counties: 15 61 63 64

Region 2 – Southern Scotland
A counties: 15 16 17 18 19 61 63 64 65 66 67 68
B counties: 13 14 20 60 62 70

Region 3 – Northern Ireland
A counties: 69 90 91 92 93 94 95 96
B counties: 67 70 71 74 75 77

Region 4 – Northern England
A counties: 20 21 22 23 40 70 71 72
B counties: 17 19 24 41 42 66 73

Region 5 – Wales
A counties: 47 48 73 74 75 76 77 78 79 80 81 82 83 84 85
B counties: 41 44 46 49 72 86

Region 6 – SW England
A counties: 49 58 86 87 88 89 99
B counties: 44 45 48 55 56 84 85

Region 7 – SE England
A counties: 50 51 52 53 54 55 56 57
B counties: 35 36 45 58 87

Region 8 – E Anglia
A counties: 24 30 31 32 33 34 35 36
B counties: 23 42 43 45 51 53

Region 9 – Midlands
A counties: 41 42 43 44 45 46
B counties: 24 33 34 35 40 47 48 49 72 73

The above regions were used for screen temperature and sunshine. For earth temperature, for which the number of stations is much less, 2 regions only were used:

Region 1 – Northern Britain
A counties: 00 01 02 03 04 05
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24
40 41 42
60 61 62 63 64 65 66 67 68 69
70 71 72 73 74 75 76 77 78 79
90 91 92 93 94 95

B counties: 30 32 33 43 44 46 47 48 80 81 82 83 84 85

Region 2 – Southern Britain
A counties: 30 31 32 33 34 35 36
43 44 45 46 47 48 49
50 51 52 53 54 55 56 57 58
80 81 82 83 84 85 86 87 88 89 99

B counties: 23 24 40 41 42 72 73 74 75 76 77 78 79

Appendix 4 - Software

Program MO3F0046

Function

To extract a given element from 1951-80 for a range of DCNN from the B Form data set, and place on a new (FOMENT-type) data set. Only stations with at least 120 months of data present are selected.

Example of card deck

```
//MO3F0046 JOB (MO3205,F),TABONY.2277,REGION=192K,PRTY=5
//  EXEC PGM=IEFBR14
//CRE DD DSN=MO3.FOMENT,UNIT=DISK,VOL=SER=MET038,DISP=(NEW,
//           KEEP),SPACE=(TRK,(44)),DCB=(RECFM=F,LRECL=76ø,
//           BLKSIZE=76ø)
//  EXEC FORTXLG
//LKED.PBS DD DSN=MET.PROGLIB,DISP=SHR
//LKED.RCT DD DSN=Mø3.ROBJLIB,DISP=SHR
//LKED.SYSIN DD *
              ENTRY MAIN
      INCLUDE PBS(GPRDMRIT,MMRIT,TPACCESS)
      INCLUDE RCT(Fø046,FABFORP,FSELSTP)
//GO.ARCHIV1ø DD DSN=Mø3.CBFORM3,UNIT=T16ø0,VOL=SER=ø3ø198,DISP=SHR
//GO.ARCHIV11 DD DSN=Mø3.FOMENT,UNIT=DISK,VOL=SER=METø38,DISP=OLD
//GO.MWRITS12 DD DSN=Mø3.FOMENT,UNIT=DISK,VOL=SER=METø38,DISP=OLD
//GO.SYSIN DD *
              data card
//
```

Data Card

5 numbers in an I5 format as follows

(i) Value – 1 if data set MO3.FOMENT is created in this run (the usual case)
– ø if data set already exists. In this case the IEFBR14 step at the beginning of the deck should be omitted.

(ii) Lowest DCNN to be accessed

(iii) Highest DCNN to be accessed

(iv) Element to be extracted from BFORM data set

(v) Last block of data set to be written (normally 3)

Example of data card

```
    1  øøøø 9999     6     3
```

This creates a data set of mean daily minimum temperatures for all stations with at least 10 years of data in the period 1951-80.

Comment

The program enables the data set to be built up in stages. Normally, however, it will be completed in one run of the program.

Program MO3F0047

Function

To access data from a FOMENT-type data set, estimate missing values, and place observations and estimates on a new (FEMENT) data set

Example of card deck

```
//Mø3Føø47 JOB (Mø32ø5,F),TABONY.2277,REGION=320K,TIME=3,PRTY=5
//  EXEC PGM=IEFBR14
//CRE DD DSN=Mø3.FEMENT,UNIT=DISK,VOL=SER=METø38,DISP=(NEW,KEEP),
//       SPACE=(TRK,(44)),DCB=(RECFM=F,LRECL=76ø,BLKSIZE=76ø)
//  EXEC FORTXLG,TIME.GO=3
//LKED.PBS DD DSN=MET.PROGLIB,DISP=SHR
//LKED.RCT DD DSN=Mø3.ROBJLIB,DISP=SHR
//LKED.SYSIN DD *
              ENTRY MAIN
      INCLUDE PBS(GPRDMRIT,MMRIT)
      INCLUDE RCT(Føø47,FMISIN,FSINGLE,FSELSTA,FDESK,FENERGY,CLALO)
//GO.ARCHIV1ø DD DSN=Mø3.FOMENT,UNIT=DISK,VOL=SER=METø38,DISP=SHR
//GO.MWRITS11 DD DSN=Mø3.FEMENT,UNIT=DISK,VOL=SER=METø38,DISP=OLD
//GO.ARCHIV12 DD DSN=Mø3.FEMENT,UNIT=DISK,VOL=SER=METø38,DISP=OLD
//GO.SYSIN DD *
              Data cards
//
```

Data Cards (I5 format)

First card: ICREATE,INREG,IDSUN
where ICREATE = 1 if data set is to be created
= ø if data set already exists. In this case the IEFBR14 step at the beginning of the deck should be removed
INREG = No of regions for which data are to be estimated
IDSUN = 1 if dealing with highest daily sun
= ø otherwise

Next follow INREG sets of cards containing
INCA,(ICA(J),J=1,INCA) and
INCB,(ICB(J),J=1,INCB)
where ICA and ICB represent the 'A' and 'B' counties for each region and INCA and INCB the number of them
See Appendix 3 for details of those used

Example of data

```
 1  1  ø
13 øø øø1 ø2 ø3 ø4 ø5 1ø 11 12 13 14 6ø 62
14 15 61 63 64
```

Subroutine SELSTA

Location — Member FSELSTA on MO3.ROBJLIB

Purpose — To read the header block of a FOMENT-type data set and produce a list of stations lying in specified counties.

CALL statement

```
CALL SELSTA(SPBF,ICO,INCO,IDCNN,INSTN)
```

Supplied to subroutine

SPBF = Real*4 = Dsref in GPACCESS
ICO = Integer*4 = Array of dimensions INCO containing counties requested
INCO = Integer*4 = No of counties requested

Returned by subroutine

IDCNN = Integer*4 = Array of dimensions INSTN containing stations within counties requested
INSTN = Integer*4 = No of stations in counties requested

Note: INSETA and CLOSET are assumed to be called in the main program

Subroutine SINGLE

Location — Member FSINGLE on MO3.ROBJLIB

Purpose — To read data from a FOMENT-type data set for a given station

CALL statement

```
CALL SINGLE(SPBF,JDCNN,PD,ND,&NN)
```

Supplied to subroutine

SPBF = Real*4 = Dsref in GPACCESS
JDCNN = Integer*4 = Station requested
NN = Statement in main program to return to if block not found for station requested

Returned by subroutine

PD = Integer*2 = Array of dimensions 2ø containing preliminary items of data block for station requested
ND = Integer*2 = Array of dimensions (3ø,12) containing main array of data block for station requested

Note: INSETA and CLOSET are assumed to be called in the main program

PART C. CALCULATION AND STATISTICS

The task described below concerns the production of the dataset MT.CLIMSTAT which contains the summary data of elements stored in the B-Form dataset with printouts in various forms of fiche. It is hoped that fiche will satisfy the needs of our internal "customers", will be useful for international exchange, universities and large institutions.

The B-Form Dataset

Using the B-Form dataset and using all stations with at least ten years of records and the "Tabony" method for estimating missing values monthly and annual values for the period 1951-1980 can be produced for:-

(i) Temperatures

(a) Absolute maximum, highest monthly mean, highest of lowest value in each month, mean of highest value in each month, overall mean, mean of the lowest value in each month, lowest of highest values in each month, lowest monthly mean, absolute minimum, standard deviation of the monthly means and standard deviation of the daily values for maximum and minimum temperatures.

(b) For mean temperature [$^1/_2$ (T_{max} + T_{min})] statistics are restricted to Highest monthly mean, overall mean and lowest monthly mean.

(c) In the case of 30 cm soil temperatures peak values are not recorded so only statistics related to means and lowest values have been evaluated.

(ii) Sunshine

Absolute maximum daily values, highest monthly total, mean of the highest value in each month, mean of monthly totals, percentage of possible of mean of monthly totals, lowest monthly total, standard deviation of monthly totals.

(iii) Rainfall

Absolute maximum daily value, highest monthly total, mean of highest value in each month, mean of monthly totals, lowest monthly total and standard deviation of the monthly totals. N.B. Since the distribution of rainfall is skew rather than normal the "Tabony" method was not considered to be ideal particularly as the coverage was far less dense than for temperature. As a compromise only stations with 28 years data or more were used for rainfall statistics except for mean of monthly totals which were evaluated in accordance with Met O 8 practices.

(iv) Rain days and Wet Days

Highest mean and lowest monthly frequencies were recorded.

(v) Decadel Averages

30 cm and 100 cm soil temperature averages for the period 1971-1980 were evaluated for the statistics described above.

The Method

1. The required element is retrieved from the B-form dataset for the period 1951-1980 and wrtten to a preallocated dataset as described in Technical Note 16B for all stations available by the program F0046. All these datasets containing observed data are stored on magnetic tape with dataset name of the form MO3.JOeeees where eeee denotes the element (eg TMAX) and s the statistic (eg M = mean). In the case of maximum temperature there are, therefore, four such datasets containing absolute maximum, averages of the highest, monthly mean, average of the lowest and standard deviation of the daily maximum. There are 30 rows (years) and 12 columns (months) in the main data array.

2. Using the "Tabony" estimation procedure (except for monthly rainfall totals mentioned above) for missing values and adding 10000 to any estimated value the data are transferred by means of the program F0047 into another dataset with identical specifications. All these datasets containing the estimated or observed data are stored on magnetic tape with dataset name of the form MO3.JEeeees where eeees is as described above.

3. By means of the program JBFORM (fixed 30 year period), JBFORMS (selected period), JBFORMR (rainfall) the required averages are computed and written to magnetic tape in 110 byte records. In addition flags are set to note where data have been estimated and the years where observed data are present. There is a "holding" data set for each element on magnetic tape which contains all the statistics and has data set name of the form MO3.JAVeeee where eeee stands for the element. All these datasets are also combined as one large dataset having the name MO3.JTRANSF.

4. Standard deviations of the daily values $\left[\sum_{j=1}^{j=y}\sigma_j^2+\sigma_m^2\right]/y-1$ are computed by program module JAVSD44 and the results added to the holding dataset for the particular element.

5. By means of the program JWR2AVDS, the holding datasets are written to the climatological statistics dataset MT.CLIMSTAT which is "GPACCESSABLE".

6. By means of the load module JAVGFISH the averages can be put out to microfiche with two stations per frame. There is also an option to output to line printer.

R Anderson-Jones
Met O 3

May 1984

MEMBER NAME	JBFORM
CATEGORY OF USE	Fortran Programmers
TYPE	Main Program
LOCATION	MO3.SRCELIB.PORT with JCL required on MO3.JCLLIB.CNTL
PURPOSE	To calculate statistics required in connexion with 1951-1980 averages.
RESULTS	Statistics output in EBCDIC to magnetic tape in a format suitable to writing to Met O 3 statistics data set MT.CLIMSTAT.
INPUT	FT99F001 station details from ML.CLIMASTR. ARCHIV36 B-FORM data with values estimated where necessary in a data set containing one element for all stations. FT05F001 Data Cards 1. COLS 1-3 Number of regions to be analysed 5 Meteorological element 7-8 Statistic to be evaluated 10-13 1980 15-18 1951 19-20 -1 22 Method of estimation (3 = R C Tabony) 2. and subsequent data cards as required containing the region numbers. Up to 27 regions per card starting in column 1 and separated by a space.
OUTPUT	FT09F001. Printout of the computed statistics. FT36F001. Magnetic tape output of computed statistics.
SUBROUTINES	ABSMAX,ABSMIN,ABSMEN,ABSSDV compiled in main program GSRSSND,GSTNDTL from MO3.OBJLIB GPRDWRIT,MWRIT,VDATES,YEARDY from MET.PROGLIB F0047,FMISIN,FSINGLE,FSELSETA,FMESK,FENERGY,CLALO from MO3.ROBJLIB.
IN EVENT OF FAILURE	Check card deck or TSO display in accordance with example below.

JCL and DATA REQUIRED

```
//T03JJB15 JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//AVGE EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT',COND=EVEN,
//FORT.SYSIN DD DSN=MO3.SRCELIB.FORT(JBFORMX),DISP=SHR
```

```
//LKED.PBS DD DSN=MET.PROGLIB,DISP=SHR
//LKED.RCT DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED.ADOBJ DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     ENTRY MAIN
     INCLUDE ADOBJ(GSRSSND,GSTNDTL)
     INCLUDE PBS(GPRDWRIT,MWRIT,VDATES,YEARDY)
     INCLUDE RCT(F0047,FMISIN,FSINGLE,FSELSTA,FMESK,FENERGY,CLALO)
//GO.FT99F001 DD DSN=ML.CLIMSTR,DISP=SHR
//GO.FT09F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1364)
//GO.ARCHIV36 DD DSN=MO3.JETMAXM,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAVMAXT,DISP=(NEW,KEEP),UNIT=T1600,
//     DCB=(RECFM=FB,LRECL=92,BLKSIZE=1840),
//     VOL=SER=841492,LABEL=(1,SL,,OUT)
//GO.SYSIN DD *
 84 3 42 1980 1951-1 3
00 01 02 03 04 05 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 30 31 32 33 34 35
36 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 44 45 47 48 60 61 62 63 64 65 66
67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
94 95 99
//
```

R Anderson-Jones
Met O 3

September 1983

MEMBER NAME — JBFORMS

CATEGORY OF USE — Fortran Programmers

TYPE — Main Program

LOCATION — MO3.SRCELIB.FORT with JCL required on MO3.JCLLIB.CNTL

PURPOSE — To calculate statistics required in connexion with 1951-1980 averages.

RESULTS — Statistics output in EBCDIC to magnetic tape in a format suitable to writing to Met O 3 statistics data set MT.CLIMSTAT.

INPUT — FT99F001 station details from ML.CLIMASTR.
ARCHIV36 B-FORM data with values estimated where necessary in a data set containing one element for all stations.

FT05F001 Data Cards

1. COLS

1-3	Number of regions to be analysed
5	Meteorological element
7-8	Statistic to be evaluated
10-13	Last Year of averaging period
15-18	First Year of averaging period
19-20	-1
22	Method of estimation (3 = R C Tabony)

2. and subsequent data cards as required containing the region numbers. Up to 27 regions per card starting in column 1 and separated by a space.

OUTPUT — FT09F001. Printout of the computed statistics.

FT36F001. Magnetic tape output of computed statistics.

SUBROUTINES — ABSMAX,ABSMIN,ABSMEN,ABSSDV compiled in main program
GSRSSND,GSTNDTL from MO3.OBJLIB
GPRDWRIT,MWRIT,VDATES,YEARDY from MET.PROGLIB
F0047,FMISIN,FSINGLE,FSELSETA,FMESK,FENERGY,CLALO from MO3.ROBJLIB.

IN EVENT OF FAILURE — Check card deck or TSO display in accordance with example below.

JCL and DATA REQUIRED

```
//T03JJB15 JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//AVGE EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT',COND=EVEN,
//FORT.SYSIN DD DSN=MO3.SRCELIB.FORT(JBFORMS),DISP=SHR
```

```
//LKED.PBS DD DSN=MET.PROGLIB,DISP=SHR
//LKED.RCT DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED.ADOBJ DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     ENTRY MAIN
     INCLUDE ADOBJ(GSRSSND,GSTNDTL)
     INCLUDE PBS(GPRDWRIT,MWRIT,VDATES,YEARDY)
     INCLUDE RCT(F0047,FMISIN,FSINGLE,FSELSTA,FMESK,FENERGY,CLALO)
//GO.FT99F001 DD DSN=ML.CLIMSTR,DISP=SHR
//GO.FT09F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1364)
//GO.ARCHIV36 DD DSN=MO3.JETMAXM,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAVMAXT,DISP=(NEW,KEEP),UNIT=T1600,
//    DCB=(RECFM=FB,LRECL=92,BLKSIZE=1840),
//    VOL=SER=841492,LABEL=(1,SL,,OUT)
//GO.SYSIN DD *
 84 3 42 1980 1951-1 3
00 01 02 03 04 05 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 30 31 32 33 34 35
36 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 44 45 47 48 60 61 62 63 64 65 66
67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
94 95 99
//
```

R Anderson-Jones
Met O 3

September 1983

MEMBER NAME JBFORMR

CATEGORY OF USE Portran Programmers

TYPE Main Program

LOCATION MO3.SRCELIB.PORT with JCL required on MO3.JCLLIB.CNTL

PURPOSE To calculate statistics required in connexion with 1951-1980 averages.

RESULTS Statistics output in EBCDIC to magnetic tape in a format suitable to writing to Met O 3 statistics data set MT.CLIMSTAT.

INPUT FT99F001 station details from ML.CLIMASTR.
ARCHIV36 B-FORM data with values estimated where necessary in a data set containing one element for all stations.

FT05F001 Data Cards

COLS

1-3	Number of regions to be analysed
5	Meteorological element
7-8	Statistic to be evaluated
10-13	1980
15-18	1951
19-20	-1
22	Method of estimation (3 = R C Tabony)

FT46F001 Read Station DCNN numbers for analysis from dataset MO3.JRAINDCN.

OUTPUT FT09F001. Printout of the computed statistics.

FT36F001. Magnetic tape output of computed statistics.

SUBROUTINES ABSMAX,ABSMIN,ABSMEN,ABSSDV compiled in main program GSRSSND,GSTNDTL from MO3.OBJLIB
GPRDWRIT,MWRIT,VDATES,YEARDY from MET.PROGLIB
F0047,FMISIN,FSINGLE,FSELSETA,FMESK,FENERGY,CLALO from MO3.ROBJLIB.

IN EVENT OF FAILURE Check card deck or TSO display in accordance with example below.

JCL and DATA REQUIRED

```
//TO3JJB15 JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//AVGE EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT',COND=EVEN,
//FORT.SYSIN DD DSN=MO3.SRCELIB.FORT(JBFORMR),DISP=SHR
//LKED.PBS DD DSN=MET.PROGLIB,DISP=SHR
```

```
//LKED.RCT DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED.ADOBJ DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.SYSIN DD *
     ENTRY MAIN
     INCLUDE ADOBJ(GSRSSND,GSTNDTL)
     INCLUDE PBS(GPRDWRIT,MWRIT,VDATES,YEARDY)
     INCLUDE RCT(F0047,FMISIN,FSINGLE,FSELSTA,FMESK,FENERGY,CLALO)
//GO.FT99F001 DD DSN=ML.CLIMSTR,DISP=SHR
//GO.FT09F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1364)
//GO.FT46F001 DD DSN=MO3.RAINDCN,DISP=SHR
//GO.ARCHIV36 DD DSN=MO3.FEMEXT,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAVRAIN,DISP=(NEW,KEEP),UNIT=T1600,
//    DCB=(RECFM=FB,LRECL=92,BLKSIZE=1840),
//    VOL=SER=841492,LABEL=(5,SL,,OUT)
//GO.SYSIN DD *
 84 3 42 1980 1951-1 3
```

R Anderson-Jones
Met O 3

September 1983

MEMBER NAME JAVSD44

CATEGORY OF USE: Fortran Programmers

TYPE: Main Program

LOCATION: MO3.SRCELIB

PURPOSE: To compute the Standard Deviation of the daily values for all months from the overall monthly means and the standard deviation of the mean daily values for each month.

INPUT:

ARCHIV36: Standard deviation monthly mean from MO3.JEeeee.

METRECS5: Overall monthly mean from holding dataset of form MO3.JAVeeees

SYSIN: data cards

CARD 1	Col	Parameter
	1-3	No of areas to search
	4-5	meteorological element (eg. 3=T_{MAX})
	6-8	statistic (always 44 for this program)
	9-13	Last year of averaging period
	14-18	First year of averaging period
	19-20	Observing practices code
	21-22	Method of estimation (3=Tabony)
CARD 2	1-2	first area) (I2,26I3)
	4-5,7-8 etc	subsequent areas)
CARD 3	1-2,4-5 etc	more areas on subsequent cards if required.

OUTPUT: FT36F001: Standard deviations of daily values output to 'holding' dataset MO3.JAVeeee.

NB eeee denotes 4 characters to describe element analysed.

JCL & DATA CARDS REQUIRED (contained in MO3.JCLLIB.CNTL(JAVSD44)

```
//T03JJ44 JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//JOBLIB DD DSN=M22.LOADLIB,DISP=SHR
//AVDS44 EXEC FORTVCLG
//FORT.SYSIN DD DSN=MO3.SRCELIB(JAVSD44),DISP=SHR
//LKED.PBS.DD DSN=MET.PROGLIB,DISP=SHR
//LKED.RCT.DD DSN=MO3.ROBJLIB,DISP=SHR
//LKED.LOD.DD DSN=M22.LOADLIB,DISP=SHR
//LKED.SYSIN DD *
      ENTRY MAIN
      INCLUDE PBS(MWRIT,METRECRD,VNEWMARK,MOVECH)
      INCLUDE RCT(F0047,FMISIN,FSINGLE,FSELSTA,FMESK,FENERGY,CLALO)
      INCLUDE LOD(AGPRW)
//GO.FT06F001 DD SYSOUT=X,DCB=(RECFM=FBA,LRECL=151,BLKSIZE=1510)
//GO.ARCHIV36 DD DSN=MO3.JE100CS,DISP=SHR
//GO.METRECS5 DD DSN=MO3.JA100CX,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAV100CD,DISP=(MOD,KEEP),UNIT=T1600,
//    DCB=(RECFM=FB,LRECL=110,BLKSIZE=2200),
//    VOL=SER=841491,LABEL=(10,SL,,OUT)
```

```
//GO.SYSIN DD *
08428 44 1980 1971-1 3
00 01 02 03 04 05 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 30 31 32 33 34 35
36 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 60 61 62 63 64 65 66
67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
94 95 99
//
```

Met O 3, Room 127
R Anderson-Jones Extn 2269

May 1984

MEMBER NAME: JAVFRCHJK

CATEGORY OF USE: Fortran Programmers

TYPE: Main Program

LOCATION: M03.SRCELIB.FORT

PURPOSE: To check if data are missing on M03.JOeeees dataset

RESULTS: Printout of one line per station containing DCNN, number of obs. in each month and year over the 30 year period.

INPUT: ARCHIV36 M03.JOeees

OUTPUT: FT06F001 Results to line printer

JCL REQUIRED: (Copy on M03.JCLLIB.CNTL (JAVFRCHK))

```
//T03JJAVK JOB (M03,J,0122),'R.A-JONES.2269'PRTY=??
//AVGE EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT',COND=EVEN
//FORT.SYSIN DD DSN=M03.ASRCELIB(JAVFRCHK),DISP=SHR
//LKED.PBS DD DSN=MET.PROGLIB.DISP=SHR
//LKED.SYSIN DD *
      ENTRY MAIN
      INCLUDE PBS(GPACCESS)
//GO.ARCHIVE36 DD DSN=M03.JORAIM.DISP=SHR
//
```

MEMBER NAME: JMO8RNAV

CATEGORY OF USE: Fortran Programmers

TYPE: Main Program

LOCATION: MO3.SRCELIB.FORT

PURPOSE: Transfers Met O 8 Average monthly rainfall totals from a Met O dataset to the Met O 3 holding dataset in the required format prior to writing to MT.CLIMSTAT.

INPUT: METRECS5 Input from Met O 8 1951-1980 average dataset MO8.RAVG5180.

OUTPUT: FT36F001 Output of average monthly rainfall values to dataset (FB,110,2210) being the form compatible for writing to Averages holding dataset. Program catalogues dataset as MO3.JAVRAINM.

FT47F001 outputs a small catalogued dataset of the DCNN's prese in MO3.JAVRAINM to disk with dataset name MO3.JRAINDCN (FB,80,800).

JCL REQUIRED (available as member JMO8RNAV on MO3.JCLLIB.CNTL

```
//TO3JJRAV JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//*MAIN CARDS=(999)
//AVGE EXEC FORTVCLG,FVPOLST='NODECK,XREF,GOSTMT,MAP'
//FORT.SYSIN DD DSN=MO3.SRCELIB.FORT(JMO8RNAV),DISP=SHR
//LKED.ADPROG DD DSN=MET.PROGLIB,DISP=SHR
//LKED.SYSIN DD *
      ENTRY MAIN
      INCLUDE ADPROG(METRECRD)
//GO.METRECS5 DD DSN=MO8.RAVG5180,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAVRAINM,DISP=(NEW,CATLG),UNIT=DISK,
//    DCB=(RECFM=FB,LRECL=110,BLKSIZE=2200),
//    VOL=SER=USR405,SPACE=(TRK,(1,1))
//GO.FT47F001 DD DSN=MO3.JRAINDCN,DISP=(NEW,CATLG),UNIT=DISK,
//    DCB=(RECFM=FB,LRECL=80,BLKSIZE=800),
//    VOL=SER=USR405,SPACE=(TRK,(1,1))
//
```

R Anderson-Jones
Met O 3
Room 127 Ext 2269

MEMBER NAME: JAVGPRES

CATEGORY OF USE: Fortran programmers

TYPE: Main program with JCL required

LOCATION: MO3.JCLIB.CNTL

PURPOSE: To create holding data set of 09 hr pressure averages ready for input to data set MT.CLIMSTAT.

INPUT: FT35F001 PCK data set of pressure averages. MO3.J09PRESS.

OUTPUT: FT36F001 holding data set of pressure averages MO3.JAVPRESS

JCL AND CARD DECK

```
//TO3JJAVQ JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//PRESS EXEC FORTVCLG
//FORT.SYSIN DD *
      DIMENSION IAVG(13),IFG(3)
      IFG(1)=0
      IFG(2)=-1
      IFG(3)=-4
      IPRAM=43
      NSTAT=22
      NUI=0
      NWEEK=-1
      IYL=1980
      IYF=1951
      IX=5
   10 READ (35,1,END=99) IDCNN,INUMYR,IAVG
    1 FORMAT (I4,I2,I3,2I5,3I2,13I5,3I6,I2)
    3 FORMAT (I5,I2,I3,2I5,3I2,13I5,3I6,I2)
      WRITE (36,2) IDCNN,IPRAM,NSTAT,IYL,IYF,NWEEK,NU1,INUMYR,IAVG,IFG,IX
      WRITE (6,3)  IDCNN,IPRAM,NSTAT,IYL,IYF,NWEEK,NU1,INUMYR,IAVG,IFG,IX
      GO TO 10
   99 STOP
      END
//GO.FT35F001 DD DSN=MO3.J09PRESS,DISP=SHR
//GO.FT36F001 DD DSN=MO3.JAVPRESS,DISP=(NEW,CATLG),VOL=SER=USR405,
//    UNIT=DISK,SPACE=(TRK,(1,1)),DCB=(RECFM=FB,LRECL=110,BLKSIZE=2200)
//
```

R Anderson-Jones
Met O 3
Room 127 Ext 2269

HOLDING DATASETS FOR CLIMATOLOGICAL STATISTICAL AVERAGES

TAPES 841490 and 841491 DCB=(FB,110,2200) den=1600 bpi

DSNAME	FILE	ELEMENT	PERIOD
MO3.JAVMAXT	1	DAILY MAX TEMP	1951-1980
MO3.JAVMINT	2	DAILY MIN TEMP	1951-1980
MO3.JAVMEAN	3	DAILY MEAN TEMP	1951-1980
MO3.JAVSUNS	4	DAILY SUNSHINE	1951-1980
MO3.JAVRAIN	5	DAILY RAINFALL	1951-1980
MO3.JAV30CM	6	DAILY 30CM SOIL TEMP	1951-1980
MO3.JAV02MR	7	RAIN DAYS	1951-1980
MO3.JAV10MR	8	WET DAYS	1951-1980
MO3.JAV30CMD	9	DAILY 30CM SOIL TEMP	1971-1980
MO3.JAV100CD	10	DAILY 100CM SOIL TEMP	1971-1980
MO3.JAV09PPP	11	DAILY 09Z PRESSURE	1951-1980

TAPES 030074 & 030091 DCB=(FB,110,2200) den = 1600 bpi

DSNAME = MO3.JTRANSF contains all the above datasets written as one file.

R Anderson-Jones
Met O 3, Room 127 Ext 2269
May 1984

CREATION OF DATASET OF CLIMATOLOGICAL STATISTICS MT.CLIMSTAT

1. The necessary space is preallocated by means of the IBM utility IEBDG.

The DD statement defines the output dataset MT.CLIMSTAT and claims 6 cylinders of disk space DCB = (F,4276,DA).

SYSIN DD DSD marks the beginning of the set of utility control statements and refers to the output dataset DD1.
CREATE constructs the number of record (900 blocks) each record being filled with X'40' (blanks).
END signifies the end of the set of utility control statements.

JCL and CONTROL statements required

```
//TO3JJDRC JOB (MO3,J,0122),R.A.JONES.2269,PRTY=10,NOTIFY=TO3JJ
//  EXEC PGM=IEBDG
//SYSPRINT DD SYSOUT=A
//DD1 DD DSN=MT.CLIMSTAT,DISP=(NEW,CATLG),UNIT=DISK,
// VOL=SER=USR405,SPACE=(CYL,6),
//  DCB=(RECFM=F,BLKSIZE=4276,DSORG=DA)
//SYSIN DD *
   DSD OUTPUT=(DD1)
   CREATE QUANTITY=900,FILL=X'40'
   END
/*
//
```

2. Fill Header and data blocks preliminary items as required for direct access via GPACCESS and main arrays with -32768 by means of source module MO3.SRCELIB(JAVDS).

LKED.PBS MET.PROGLIB to include MWRIT and MOVECH
GO.MWRITS36 to output to MT.CLIMSTAT

JCL Required

```
//TO3JJAVD JOB (MO3,J,0122),'R.A-JONES.2269',PRTY=??
//*INFORM PRINTDATA
//AVDS EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT'
//FORT.SYSIN DD DSN=MO3.SRCELIB(JAVDS),DISP=SHR
//LKED.PBS   DD DSN=MET.PROGLIB,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE PBS(MWRIT,MOVECH)
      ENTRY MAIN
//GO.MWRITS36 DD DSN=MET.CLIMSTAT,DISP=OLD
//
```

R Anderson-Jones
Met O 3 Room 127 Ext 2269
May 1984

MEMBER NAME JWR2AVDS

CATEGORY OF USE: Fortran Programmers

TYPE: Main program

LOCATION: MO3.SRCELIB

PURPOSE: To write previously computed averages and associated flags from a 'temporary holding' dataset created by program JBFORM, JBFORMR or JBFORMS into the climatological Average dataset MT.CLIMSTAT.

INPUT:
METRECS5 Averages 'holding' dataset MO3.JAVeeees
ARCHIV01 Climatological Average dataset MT.CLIMSTAT
FT99F001 Climatological Station particulars dataset ML.CLIMASTR.

OUTPUT:
ARCHIV01 Climatological Averages dataset MT.CLIMSTAT
FT06F001 Header blocks and last block written output to line printer and error messages.

IN THE EVENT OF FAILURE: Check card deck or TSO display in accordance with example below. If it is suspected that the data set has been partially written with corrupt data, restore the dataset via ABR without delay.

JCL CARDS REQUIRED: (also contained in MO3.JCLLIB.CNTL(JAVDS))

```
//MO3JAVDS JOB (MO3,J,0122),'R.A.-JONES.2269',
//     TIME=5,
//     PRTY=5
*INFORM PRINTDATA
//AVGE EXEC FORTVCLG,FVPDECK='NODECK,MAP,XREF,GOSTMT',
//     TIME.GO=5
//FORT.SYSIN DD DSN=MO3.SRCELIB(JWR2AVDS),DISP=SHR
//LKED.ADOBJ DD DSN=MO3.OBJLIB,DISP=SHR
//LKED.ADPROG DD DSN=MET.PROGLIB,DISP=SHR
//LKED.SYSIN DD *,DCB=BLKSIZE=80
//GO.FT06F001 DD SYSOUT=X,DCB=(RECFM=FBA,LRECL=151,BLKSIZE=1510)
//GO.FT99F001 DD DSN=ML.CLIMASTR,DISP=SHR
//GO.ARCHIV01 DD DSN=MT.CLIMSTAT,DISP=OLD
//GO.METRECS5 DD DCB=(RECFM=FB,LRECL=110,BLKSIZE=2200),DISP=SHR,
//     VOL=SER=841491,UNIT=T1600,DSN=MO3.JAV100CD,LABEL=(10,SL,,IN)
//
```

R Anderson-Jones
Met O 3 Room 127 Ext 2269
May 1984

Dataset of Climatological Statistics MT.CLIMSTAT

Contains a number of statistics (means, extremes, standard deviations) of both daily and hourly data.

Structure The blocksize is DCB = (F,4276)

The first three blocks are reserved for the header index which point to the first block for each station. If data require more than one block then the continuation blocks are indicated by NCONT, item 12 in the preliminary aray to the data blocks (NCONT = -32768 indicates no continuation blocks).

Header block Index pointing to the data for each station

Preliminary array:

Item	Mnemonic	Description
1	NOP	Number of items in the preliminary array (8)
2	NOU	Number of records in the index
3	NIR	Number of items in one index record (4)
4	NOF	=NIR
5	NEBLK	Number of first empty data block.
6	-	-
7	NBLK	Number of this block (0)
8	NVBLK	Total number of blocks allocated to the dataset.

Main array - index:

Item	Mnemonic	Description
1	NDCNN	Climatological station number
2	NII	WMO country block number
3	NIII	WMO station number
4	NBLK	Number of first block for this station

In some cases one of the station numbers can be missing, ie NDCNN=-32768 for overseas stations or NII=NIII=-32768 for some UK climatological stations.

Data Blocks Contains the climatological statistics

Preliminary array:

Item	Mnemonic	Description
1	NOP	Number of items in the preliminary array (14)
2	NOU	Number of records in the main array (max 88)
3	NIR	Number of items in one data record (24)
4	NOF	=NIR
6	NDCNN	Climatological station number
7	NII	WMO country block number
8	NIII	WMO station number
9	NLAT	Latitude
10	NLON	Longitude
11	-	-
12	NCONT	Number of next block with data for this station (-32768 if no more blocks)
13	NBLK	Number of this block
14	-	-

Main array: Daily Data

Item	Mnemonic	Description
1	PARAM	Type of parameter
2	NSTAT	Type of data and statistical operation
3	NYL	Last year from which statistic computed
4	NYF	First " " " " "
5	PRACTD	Bit indicates days of week with regular observations.
6	-	Not used.
7	-	Not used.
8	NVAL1	Value for January.
-	-	- - -
19	NVAL12	Value for December.
20	NVALY	Value for whole year.
21	NMISS	13 bits set if any data missing during period.
22/23	NDAT	30 bits each set for year of complete data.
24	NMTHOD	Method used to derive statistic (3 = Tabony 4 = Woodley).

Hourly Data

1	PARAM	Type of parameter
2	NSTAT	Type of data and statistical operation
3	NYL	Last year from which statistic computed
4	NYF	First " " " " "
5)	PRACTH	Bit set for each hour observed
6)		
7	NOBS	Number of observations in one day
8	NVAL1	Value for first hour observed
9	NVAL2	Value for second hour observed
-	-	
19	NVAL12	Value for 12th hour observed

20	NVALD	Value for the day
21	NMTHOD	Method used to derive statistic.

If NOBS > 12 then the data are continued in the next record with the same preamble in items 1-7 and the first data value at item 8.

Code for PARAM - Parameter code

Since most of the data originated from the daily datasets, this code uses the same parameter code, but will be extended for other parameters, eg soil temperatures and some hourly parameters.

Code for NSTAT - Es_2s_1 - Three components, type of data E, followed by two statistical operations s_1 and s_2.

E	Type of Data
0	Data value
1	Date of event
2	Hour of event
3	Minute of event
.	. . .
8	Value of
9	Direction of

s	Statistical Operation
0	Sample size
1	Highest
2	Mean
3	Lowest
4	Standard deviation
5	Frequency value exceeds threshold or satisfies criterion.
6	Frequency value not exceed threshold.
7	Total
8	Percentage of average
9	Percentage of maximum possible

Usually the statistical operation is carried out in two steps on a set of data x_{ij} ($i = 1$ to n_j, the number of days in month j, and $j = 1$ to y, the number of years to be processed).

Operation s_1 : Compute statistics for each month from the daily values, ie in the jth month.

$$\text{Highest} = h_j = \underset{1}{\overset{i=n_j}{\text{Max}}}\,(x_{ij}) \qquad \text{lowest} = l_j = \underset{1}{\overset{i=n_j}{\text{Min}}}\,(x_{ij})$$

$$\text{Mean} = \bar{x}_j = \frac{1}{n_j}\sum_{1}^{i=n_j} x \qquad \text{variance} = \sigma_j^2 = \frac{1}{n-1}\sum_{1}^{i=n_j}(x_{ij} - \bar{x}_j)^2$$

Operation s_2 : Compute y year statistics, usually determined from the results of Operation s_1. The combined code s_2s_1 then has the following possibilities:

s_2s_1	Description	Definition
11	Absolute maximum (highest daily value in y years)	$\underset{j=1}{\overset{j=y}{\text{Max}}}\, h_j$
12	Highest monthly mean	$\text{Max}\ \bar{x}_j$
13	Highest of the lowest value for each month	$\text{Max}\ l_j$
14	Highest of the individual monthly s.d.	$\text{Max}\ \sigma_j$
21	Mean of the highest value in each month	$\frac{1}{y}\sum_{1}^{j=y} h_j = \bar{h}$
22	Overall mean	$\frac{1}{y}\sum \bar{x}_j = \bar{\bar{x}}$
23	Mean of the lowest value in each month	$\frac{1}{y}\sum l_j = \bar{l}$
24	Mean of the standard deviations (Meaningless)	—
31	Lowest of highest value in each month	$\underset{j=1}{\overset{j=y}{\text{Min}}}\, h_j$
32	Lowest monthly mean	$\text{Min}\ \bar{x}_j$
33	Absolute minimum	$\text{Min}\ l_j$
34	Lowest of the individual monthly s.d.	$\text{Min}\ \sigma_j$
41	s.d. of the highest monthly value in each month	$\frac{\text{Variance}}{\frac{1}{y-1}\sum (h_j - \bar{h})^2}$
42	s.d. of the monthly means	$\frac{1}{y-1}\sum (x_j - \bar{\bar{x}})^2 = \sigma_m^2$
43	s.d. of the lowest monthly value in each monch	$\frac{1}{y-1}\sum (l_j - \bar{l})^2$
44	Overall standard deviation	$\frac{1}{y-1}\sum \sigma_j^2 + \sigma_m^2$

Note: The description of 44 is by definition, i.e. it is not intended that it is the s.d. of the monthly s.d. which would be a useless statistic.

Part D: Presentation of averages

A 'single-element' presentation containing all parameters for that element was made available by R Anderson-Jones under load module JAVGFISH (see part C). A slimmed-down version of this, containing only the main parameters for the element, was provided by C Ormonde (undocumented program).

The 'Multi-element' presentation is available in 2 forms, documented in the following pages. The first provides a complete list of all information held on the averages data set for a specfied range of stations, while the second presents a slimmed-down version, containing only the main parameters for each element.

A print-out of the individual monthly values used in the calculation of the averages is provided by R Tabony under program QQ115.

PROGRAM

NEAVFICH

LOCATION

OBJECT M03.BRANCH.OBJ (NEAVFICH,NEAVMAIN,NEAVALST)

SOURCE M03.DEADFORT (NEAVFICH,NEAVMAIN,NEAVALST)

AIM

TO PRINT OUT ALL OR A SUBSET OF THE 1951 - 80 AVERAGES,
AS CONTAINED IN THE DATASET 'ML.CLIMSTAT' FOR A
SELECTION OF STATIONS.

METHOD OF USE

```
//* **  DON'T FORGET TO INCLUDE THE 'CARDS' LINE IF YOU SELECT THE
//* **  'ALL STATIONS' OPTION FOR FICHE OUTPUT
//*MAIN CARDS=(999,C)
//*
//     EXEC FORTVLG
//LKED.METPROG DD DSN=MET.PROGLIB,DISP=SHR
//LKED.M03OBJ DD DSN=M03.BRANCH.OBJ,DISP=SHR
//LKED.SYSIN DD *
      INCLUDE METPROG(GPAY, ISZDAY)
      INCLUDE M03OBJ(GSTNDTL,NEAVMAIN,NEAVFICH,NETOTAL)
/*
//GO.FT05F001 DD *
```

SEE BELOW FOR DETAILS OF FT05F001 INPUT

```
//GO.FT06F001 DD SYSOUT=M,DCB=(LRECL=151,BLKSIZE=1510,RECFM=FBA)
//GO.FT07F001 DD SYSOUT=X,DCB=(LRECL=151,BLKSIZE=1510,RECFM=FBA)
//GO.ARCHIV01 DD DSN=MT.CLIMSTAT,DISP=SHR
//GO.FT99F001 DD DSN=ML.CLIMASTR,DISP=SHR
//
```

INPUT

FT05F001 A) IF THE FT05F001 IS EMPTY THE PROGRAM DEFAULTS TO
PRINTING DATA FOR ALL STATIONS.

B) BY PUTTING A LIST OF STATION DCNNS IN I4 FORMAT
IN THIS SLOT ONLY THE DATA FOR THESE STATIONS WILL
BE PRINTED.

C) IF -1 IS PLACED IN THE 3RD AND 4TH CHARACTERS THE
PROGRAM THEN EXPECTS THE NEXT LINE TO CONTAIN TWO
I5 NUMBERS - A RANGE OF DCNNS WHICH SPECIFY THE
FIRST AND LAST DCNNS WHOSE DATA IS TO BE PRINTED OUT.

ARCHIV01 STATISTICS DATASET ML.CLIMSTAT OR IT'S LOOKALIKE.

FT99F001 STATION LIST ML.CLIMASTR - USED TO GET STATION DETAILS

TO PRINT IN PAGE HEADING.

OUTPUT

FT07F001 STATION AVERAGES AS REQUESTED.

FT06F001 SOME DIAGNOSTIC MESSAGES.....CAN NORMALLY BE DUMMIED OUT

N.B.....
NORMALLY A SPECIFIC SUBSET OF THE STATISTICS AVAILABLE ARE
PRINTED. IF YOU REQUIRE ALL STATISTICS INCLUDE MEMBER
NEAVALST FROM 'M03.BRANCH.OBJ' INSTEAD OF NEAVFICH.

Example of output from NEAVFICH

1951 - 1980 CLIMATOLOGICAL AVERAGES — PREPARED BY ADVISORY SERVICES BRANCH — 20/ 1/1986

DATA FOR SHOEBURYNESS — LAT 51.5N LONG 0.8E N. G. R. 5948 1857 ALTITUDE 2 METRES DCNN 3671

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
MAXIMUM TEMPERATURE (DEG C)	6.4	6.8	9.2	11.9	15.6	19.0	20.8	20.6	18.5	14.8	10.1	7.8	13.5
AVERAGE WARMEST DAY	11.5	11.9	15.3	18.0	21.5	24.8	26.1	25.2	23.5	19.2	15.2	12.8	----
MONTHLY AVERAGE	0.8	1.9	3.6	7.2	10.7	13.9	16.4	16.7	14.5	10.1	4.9	2.1	----
AVERAGE COLDEST DAY	-4.7	-3.7	-2.5	-1.0	2.1	5.7	8.2	8.2	5.7	2.4	-1.4	-3.2	----
MINIMUM TEMPERATURE (DEG C)	1.8	1.6	2.9	4.6	8.0	11.0	13.1	13.1	11.4	8.6	4.9	2.9	7.0
AVERAGE WARMEST NIGHT	7.1	6.5	7.8	9.2	12.6	15.2	17.1	17.1	16.0	13.8	10.7	8.5	----
MONTHLY AVERAGE	4.1	4.2	6.1	8.3	11.8	15.0	17.0	16.9	14.9	11.7	7.5	5.3	10.2
AVERAGE COLDEST NIGHT	-0.7	-0.7	0.4	2.2	5.5	8.7	10.8	10.7	9.1	5.9	2.4	0.3	----
MEAN TEMPERATURE (DEG C)	3.1	3.1	4.8	6.7	9.9	13.0	15.0	14.9	12.9	9.8	6.1	4.1	8.9
MONTHLY AVERAGE	2.4	2.6	4.3	6.2	9.4	12.5	14.5	14.4	12.4	9.3	5.6	3.6	----
SUNSHINE (HOURS)	6.9	8.3	9.8	12.1	13.9	14.3	13.9	12.6	10.8	9.0	7.5	6.1	----
AVERAGE SUNNIEST DAY	52.6	68.5	120.1	157.3	210.6	220.5	202.4	193.5	156.7	115.4	69.3	47.0	1613.9
AVERAGE MONTHLY TOTAL	20.2	24.3	32.7	37.9	43.5	44.4	40.5	42.7	41.2	34.8	25.9	19.1	36.0
AV AS % OF POSSIBLE	1.7	2.4	2.6	2.9	3.3	3.4	3.1	3.3	3.2	2.7	2.0	1.5	----
RAINFALL (MM)	9.0	8.6	11.3	9.1	13.6	16.3	17.2	17.6	21.2	12.6	13.5	11.3	532
AVERAGE WETTEST DAY	40	34	38	33	39	47	45	55	59	45	53	44	----
AVERAGE MONTHLY TOTAL	2.4	2.6	4.3	6.2	9.4	12.5	14.5	14.4	12.4	9.3	5.6	3.6	----
RAIN DAYS 0.2MM OR MORE	15	13	13	12	12	10	10	12	11	12	15	15	----
AVERAGE MONTHLY TOTAL	2.4	2.6	4.3	6.2	9.4	12.5	14.5	14.4	12.4	9.3	5.6	3.6	----
WET DAYS 1.0MM OR MORE	10	8	8	7	8	8	7	9	8	8	10	10	101
AVERAGE MONTHLY TOTAL	2.4	2.6	4.3	6.2	9.4	12.5	14.5	14.4	12.4	9.3	5.6	3.6	----

Example of output from NEAVALST

1951 - 1980 CLIMATOLOGICAL AVERAGES PREPARED BY ADVISORY SERVIC

DATA FOR HEATHROW LAT 51.5N LONG 0.4W N. G. R. 5077

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
MAXIMUM TEMPERATURE (DEG C)								
WARMEST DAY	14.5	17.2	22.3	24.1	31.7	34.8	34.2	34.2
WARMEST MONTH	10.3	10.3	13.9	15.5	19.6	25.5	26.6	25.9
AVERAGE WARMEST MONTH	12.0	12.7	16.5	20.1	24.8	26.8	28.8	27.4
OVERALL MEAN	6.8	7.3	10.2	13.2	17.1	20.5	22.0	21.6
AVERAGE COLDEST DAY	0.7	2.1	4.0	7.5	11.2	14.5	16.8	16.3
COLDEST MONTH	0.8	2.8	7.4	10.7	15.0	17.3	19.2	18.8
COLDEST DAY	-4.6	-3.9	0.0	2.6	7.5	11.1	14.3	13.3
S.D. OF MONTHLY MEANS	1.8	2.0	1.7	1.1	1.4	1.8	1.8	1.6
S.D. OF DAILY VALUES	3.6	3.6	3.6	3.5	3.8	3.8	3.5	3.2
MINIMUM TEMPERATURE (DEG C)								
WARMEST NIGHT	11.1	10.0	10.6	12.6	15.6	20.8	20.4	21.7
WARMEST MONTH	4.4	4.9	5.7	7.1	9.8	13.7	14.9	15.0
AVERAGE WARMEST NIGHT	7.5	6.9	8.3	9.8	12.9	15.3	17.2	16.8
OVERALL MEAN	1.1	1.3	2.6	4.6	7.8	10.9	12.9	12.6
AVERAGE COLDEST NIGHT	-5.6	-4.0	-2.9	-0.5	2.5	6.1	8.3	7.8
COLDEST MONTH	-4.5	-3.6	-0.5	2.4	6.4	9.0	11.7	10.9
COLDEST NIGHT	-13.2	-9.4	-7.4	-2.7	-0.9	1.5	5.6	5.6
S.D. OF MONTHLY MEANS	1.8	1.8	1.4	1.0	0.9	1.0	0.8	0.9
S.D. OF DAILY VALUES	3.9	3.4	3.3	2.9	2.8	2.7	2.3	2.5
MEAN TEMPERATURE (DEG C)								
WARMEST MONTH	7.4	7.6	9.8	11.1	14.7	19.6	20.7	20.4
OVERALL MEAN	3.9	4.3	6.4	8.9	12.5	15.7	17.4	17.1
COLDEST MONTH	-1.9	-0.3	3.4	7.3	11.0	13.3	15.4	14.9
S.D. OF MONTHLY MEANS	1.7	1.8	1.4	0.9	1.1	1.3	1.3	1.2
SUNSHINE (HOURS)								
SUNNIEST DAY	7.8	9.7	11.0	13.5	15.2	15.8	15.4	13.9
SUNNIEST MONTH	82.5	105.5	172.9	207.6	252.0	293.7	276.9	263.7
AVERAGE SUNNIEST DAY	5.3	6.6	7.8	9.6	11.1	11.6	11.2	10.1
AVERAGE SUNSHINE	48.8	62.6	110.8	146.9	196.1	206.0	189.7	176.4
DULLEST MONTH	28.0	27.0	65.0	73.5	145.2	134.8	129.9	103.1
S.D. OF MONTHLY TOTALS	15.5	17.8	29.3	31.7	28.6	48.5	39.4	35.9
AV AS % OF POSSIBLE	18.7	22.2	30.1	35.4	40.6	41.5	38.0	39.0
RAINFALL (MM)								
WETTEST DAY	21.3	20.1	29.9	28.5	31.3	52.5	70.4	57.0
WETTEST MONTH	92.3	121.4	95.1	98.6	103.2	127.7	130.5	150.3
AVERAGE WETTEST DAY	11.6	9.3	10.8	10.8	14.3	17.9	19.2	20.4
AVERAGE MONTHLY TOTAL	5.1	3.8	4.3	4.1	4.8	5.1	5.1	5.8
DRIEST MONTH	12.9	2.3	5.7	5.7	4.2	6.1	7.1	13.3
S.D. OF MONTHLY TOTALS	22.4	25.9	25.8	22.3	25.7	31.8	30.3	30.5
RAIN DAYS 0.2MM OR MORE								
HIGHEST MONTHLY TOTAL	22	24	23	23	24	18	21	22
AVERAGE TOTAL	16	12	13	13	13	11	11	12
LOWEST MONTHLY TOTAL	9	2	3	4	4	2	2	4
WET DAYS 1.0MM OR MORE								
HIGHEST MONTHLY TOTAL	19	18	17	18	17	12	15	16
AVERAGE TOTAL	11	8	9	9	9	7	8	9
LOWEST MONTHLY TOTAL	2	0	2	2	1	1	2	2

Print out of observations and estimates used in calculations of 51-80 averages

Data sets containing arrays of data for 30 years x 12 months are held on tape 840162 (6250 bpi, back up 840163) under the following arrangement:-

LABEL	DSN	EXPLANATION	
1	MØ3.JEMEANM	Mean temperature	
2	RAINH	Highest daily rainfall	
3	RAINM	Monthly rainfall	
4	RAINS	S D of daily rainfall	
5	SUNNH	Highest daily sun	
6	SUNNM	Monthly sun	
7	SUNNS	S D of daily sun	
8	TMAXH	(Warmest Day	ie 'Monthly Max'
9	TMAXL	(Coldest Day	
10	TMAXM	Max temp (Monthly Mean	ie 'Daily Max'
11	TMAXS	(S D of daily values	
12	TMINH	(Warmest night	
13	TMINL	(Coldest night	ie 'Monthly Min'
14	TMINM	Min temp (Monthly mean	ie 'Daily Min'
15	TMINS	(S D of daily values	
16	Ø2MMR	Rain days	
17	1ØMMR	Wet days	
18	1ØØCL	(Lowest value	
19	1ØØCM	1ØØ cm soil temp (Monthly mean	
20	1ØØCS	(S D of daily values	
21	3ØCML	(Lowest value	
22	3ØCMM	3Ø cm soil temp (Monthly mean	
23	3ØCMS	(S D of daily values	

On these data sets, estimated values have had 10,000 added to them. Some missing values remain and are indicated by -22768.

Fiche copies of the data sets for stations in specified counties are produced by program MØ3.RSRCELIB (QQ115) which is implemented by MØ3.JCLLIB.CNTL(QQ115). This uses routine MIITITLF to produce eye legible titles on the fiche and these have to be supplied under 'TITLE1' and 'TITLE2'.

Data required by the program is as follwos:-

First lines:- INCO, (ICO(J), J = 1, INCO)
where INCO = No of counties
ICO = List of counties determining which stations will have their data printed.

Penultimate line:- TITLE to be printed at top of page. This will refer to the element and can be up to 30 characters long.

Last line: ITOT, DIV
where ITOT = Ø for annual values to be set equal to the mean of the monthly values (eg for temperatures).
1 for annual values to be set to the total of the monthly values (eg for sunshine).
DIV = Divisor to bring units to standard values
= 1ØØ.Ø for temperature and 1Ø.Ø for sunshine.
(Original units as on B form data set).

Example

```
//STEP1 EXEC FORTVCL
//FORT.SYSIN DD DSN = MØ3.RSRCELIB (QQ115), DISP = SHR
//LKED.RCT   DD DSN = MØ3.ROBJLIB, DISP = SHR
//LKED.PBS   DD DSN = MET.PROGLIB, DISP = SHR
//LKED.SYSIN DD *
      ENTRY MAIN
      INCLUDE RCT (FSELSTA, FSINGLE)
      INCLUDE PBS (GPA)
// EXEC MIITIILF, PROG = MAIN, LIB = '*.STEPLIB.LKED.SYSLMOD',
//      OUTPUT = FTØ6FØØ1,
//      TITLE1 = '1951-80 MONTHLY MINIMUM TEMPERATURE',
//      TITLE2 = 'SCOTLAND'
//      PLRITY = 'REVERSE'
//GO.FTØ6FØØ1 DD SYSOUT = M, DCB = (RECFM = FBA, LRECL = 133, BLKSIZE = 1463),
//GO.ARCHIV1Ø DD *
    25  ØØ  Ø1  Ø2  Ø3  Ø4  Ø5  1Ø  11  12  13  14  15  16  17
    18  19  6Ø  61  62  63  64  65  66  67  68
 MONTHLY MINIMUM TEMPERATURE
    Ø 1ØØ.Ø
//
```